POPULAR PICTURE
and
PLAN BOOK
of RAILROAD CARS
and LOCOMOTIVES

Popular Picture and Plan Book of Railroad Cars And Locomotives

Edited by

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and The Locomotive Cyclopedia

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Electric Locomotive built by General Electric Company hauling a heavy coal train on the Virginian Railway

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Car STR

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FOREWORD

THIS volume was specially prepared to be used as a handy reference book by railroad hobbyists, model makers, and for all other persons interested in railroad cars and locomotives. Many of these people have, in fact, inquired in the past for plans and photographs of just such equipment.

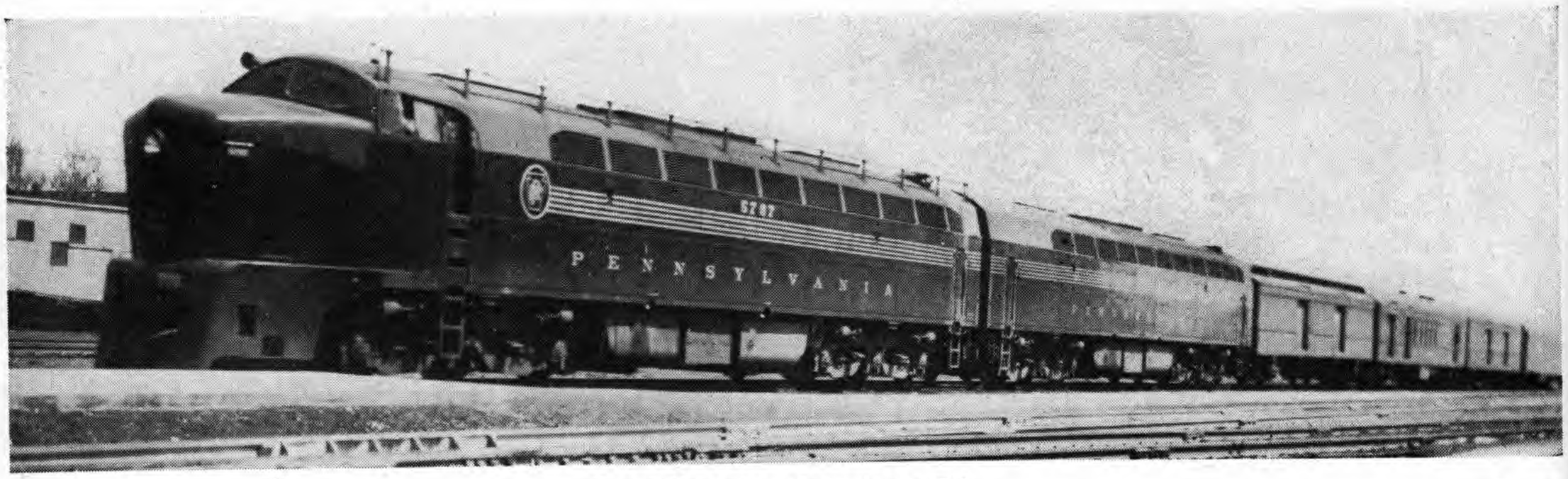
The Locomotive Cyclopedia and the Car Builders' Cyclopedia, published by the Simmons-Boardman Publishing Corporation contain this material and hundreds of these books have been sold over a period of years to railroad enthusiasts. However, the cyclopedias are large books intended primarily to be used by men engaged in earning their livelihood from the railroad industry and the books contain a great amount of other information that would not be of any particular use to the hobbyist.

To provide the hobbyist with the actual working plans for their favorite cars and locomotives, a group of car and locomotive photographs and plans that cover a representative number of types built during the past twenty years has been brought together in this volume. These plans and pictures were carefully selected from the 1947 and 1950 Locomotive Cyclopedias and the 1949 Car Builders' Cyclopedia and include brief descriptions telling how the various types originated and their use today. We believe that this material will provide the model makers with sufficient information to build a wide variety of prototypes such as can be seen on almost any railroad today.

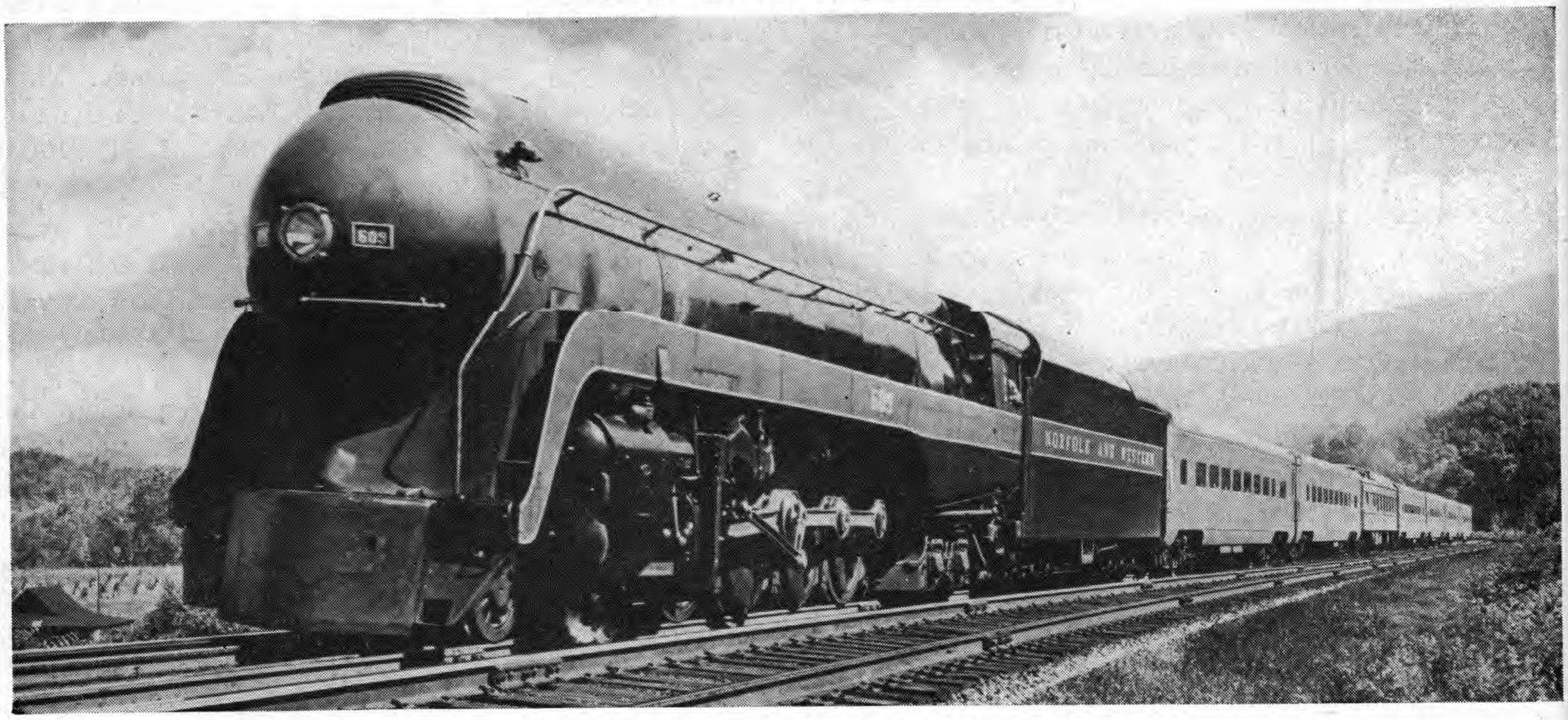
For the student of car and locomotive design this book provides a wealth of material that is not to be found in any other popular work and therefore it is recommended for use in educational fields.

Walter A. Lucas

The Empire State Express—New York Central
ALCO-G.E. Diesel-Electric Locomotive



The Jeffersonian—Pennsylvania R.R.
Baldwin Diesel-Electric Locomotive



The Powhatan Arrow—Norfolk & Western
Steam locomotive built by the railroad.

Steam Locomotives

STEAM locomotive construction for domestic use has today almost come to a complete halt because of the replacement of steam motive power by Diesel-electric locomotives. At the present time only one railroad, the Norfolk & Western, is ordering steam locomotives and this order is being built by the railroad in its own shops. Most of the modern types of steam locomotives now in use such as 2-8-4, 2-10-4, 4-6-4 and 4-8-4, are modifications of older types with the substitution of four-wheel for two-wheel trailing trucks. In early types, the firebox was suspended between the engine frames, and, being limited by the frame clearances, necessarily was narrow and practically governed the grate area obtainable. About the year 1881 some locomotives were built having the firebox foundation rings raised to the top of the frames and widened to occupy the entire width between the driving wheels. This made possible a substantial increase of grate area and heating surface which added to the steaming capacity of the boiler. The Wootten type boiler with a large grate area for burning anthracite was introduced on the Philadelphia & Reading in 1878. At the present time little anthracite is burned in locomotives.

About the year 1893 a locomotive was built with the firebox in back of the rear driving wheels and widened to extend the full width of the locomotive, the resulting increase in firebox length being accommodated by carrying the rear end of the locomotive frame on a trailing truck having small diameter wheels entirely below the foundation ring. With this type of construction firebox dimensions were limited only by the railway line clearances and by the ability of the fireman to shovel coal; the tubes were lengthened, greater heating surfaces were obtained and the size of locomotives was greatly increased. A further advance took place in 1925 when the four-wheel trailing truck was developed.

In later years, the tendency has been to obtain greater capacity and efficiency by refinement in design and by the perfecting of such appliances as superheaters, mechanical stokers and feedwater heaters. Improved combustion, a better proportioning of the boiler to steam demands, higher steam pressure and greater superheat, together with better locomotive utilization and train operation, coupled with longer runs, have brought about a marked reduction in the average amount of coal consumed per 1,000 gross ton miles.

A secondary engine—known as a "booster"—was developed for use on locomotives having two- or four-wheel trailer trucks. The booster was applied to a truck axle and provided additional tractive force that assisted the main engines in starting heavy trains and when traveling up grades.

The slide valve type of engine was in common use until about 1900 when the piston valve was introduced in locomotive design. This valve is the one now in general use. In American practice, steam locomotives are invariably provided with single-expansion cylinders. The only exception being some Mallet articulated compounds in slow, heavy freight service. Other classes of compound locomotives were extensively used 50 years ago. These were of the two-cylinder, cross-compound variety and four cylinder compounds having super-imposed cylinders or arranged in tandem.

Many different types of locomotives have been built but several which proved to be the most efficient became standard in America. These types, varying on the different railroads in details of construction, are of three general classes—freight, passenger, and switching locomotives.

Locomotive Inventory

There were on the railroads of the United States on December 31, 1948, the latest date available, a total of 34,581 steam locomotives. Coal was used for fuel in a large percentage of this number but oil fuel was also used extensively—in 6,124 locomotives—on railroads remote from coal supplies or where the fire hazard from locomotive sparks is great, as in forest country. The total number of steam locomotives is constantly decreasing as more Diesel-electric locomotives are built to replace them in all classes of service.

Freight Locomotives

Freight locomotives generally have a two-wheel leading truck to help support the front end and guide the locomotive around curves. The truck is located under the forward end of the boiler. Driving wheels, formerly of a relatively small diameter, usually 63 in. or under, are now larger. The rear end of the boiler and the firebox are either supported on a separate rear frame or cradle carried on a trailing truck, or, when without trailing trucks, on an extension of the frames. The large proportion of the total weight resting on the driving wheels provides the adhesion necessary for the large tractive force required to haul todays long heavy trains. Most modern freight locomotives, owing to increased speeds have driving wheels of 69 in. or 70 in. diameter.

Locomotives commonly included in this class, and now in general use in America, are: Consolidation—2-8-0; Mikado—2-8-2; Berkshire—2-8-4; Decapod—2-10-0; Santa Fe—2-10-2; Texas—2-10-4; and various artic-

ulated types. Pacific type—4-6-2; Mountain type—4-8-2, and the 4-8-4 type, all originally designed for passenger service, are today also used for fast freight.

The 2-6-0—Mogul type locomotive was introduced in 1863 following the invention of the Bissell truck. This wheel arrangement became quite popular but very few locomotives of the mogul type are now in use.

The 2-6-2—Prairie type locomotive was first built in 1900 for freight service on the Chicago, Burlington & Quincy. It was simply a Mogul with a pair of trailing wheels added under the firebox. This arrangement permitted the use of a wide firebox having a relatively short length but giving a large grate area. It permitted easy hand firing which was not possible with the extremely long firebox of the earlier narrow type. The Prairie type has been supplanted by heavier locomotives.

The 2-8-0—Consolidation type is the logical step after the mogul type, having an additional pair of driving wheels and consequently greater hauling capacity. It was first constructed in 1866 for the Lehigh Valley and is still used on some railroads in light freight service.

The 2-8-2—Mikado type was developed from the 2-8-0 type, having the same number of driving wheels and, in addition, a two-wheel trailing truck under the firebox. This arrangement gives the advantages of a wide firebox in conjunction with a large boiler; the resulting high steaming capacity permits a more sustained use in heavy service. This type was first built in 1897 for use in Japan from whence the name Mikado was derived. It is still a common type for American freight service.

The 2-8-4—Berkshire type was an evolution from the 2-8-2 type, having the same number of driving wheels but with a four-wheel instead of a two-wheel trailing truck. This wheel arrangement permitted a better boiler design with a larger grate area. It was used first on the Boston & Albany in 1925, having been designed by the Lima Locomotive Works, Inc.

The 2-10-0—Decapod type locomotive first built by Norris Locomotive Works for the Lehigh Valley in 1867, is similar to the Consolidation type except that it has an additional pair of driving wheels. This permitted the use of a still larger boiler and provided greater adhesion and tractive force. This type is well adapted for heavy drag freight service and is extensively employed on the Pennsylvania Railroad.

The 2-10-2—Santa Fe type was a step forward from the 2-10-0 type in the direction of heavier motive power. It has an additional pair of driving wheels which provide for a greater length of boiler and firebox with the result that greater steam capacity and tractive force is obtained. This type was first built in 1903 for use on the Atchison, Topeka and Santa Fe and for that reason was designated as the "Santa Fe" type. It is in use on many railroads in the United States.

The 2-10-4—Texas type was an evolution from the 2-10-2 type, having the same number of driving wheels but with a four-wheel instead of a two-wheel trailing truck. This wheel arrangement permitted a better boiler design with a larger grate area. It was first used on the Texas & Pacific in 1925, having been designed by the Lima Locomotive Works, Inc.

Articulated Locomotives

Articulated locomotives were built as early as 1832. The Mallet articulated compound locomotive, introduced in Europe in 1887, was not built in the United States until 1904—an 0-6-6-0 type used in heavy freight service on the Baltimore and Ohio. This type has two sets of frames—rear frames held rigidly in alignment with the boiler, and front frames connected to the rear unit by a pivot joint. Each set of frames is carried on a separate group of driving wheels—four, six, eight, or ten, depending on the size of the locomotive. Usually the front frames support the forward end of the boiler on sliding frame bearings that allow the leading unit to swivel radially about the pivot connection, giving the effect of a truck. These features make possible a locomotive with a short rigid wheelbase and moderate wheel pressures but having large tractive force. Some articulated locomotives have been built with the leading unit as well as the rear unit rigidly secured to the boiler, the swiveling effect being obtained by means of an articulated or flexible boiler. This type of locomotive is no longer in use.

When the engine is of the compound design—the real Mallet arrangement—the rear group of wheels is driven by high-pressure cylinders mounted on the rear frames at the leading drivers. The front group is driven by low-pressure cylinders mounted at the leading drivers of the group. Steam from the boiler enters the high-pressure cylinders, is exhausted through a flexible pipe connection to the low-pressure cylinders, where it further expands and then is exhausted to the front end and thence to the atmosphere. This system of compounding was first proposed by Anatole Mallet, a native of Switzerland, from whom this type of locomotive takes its name.

A few articulated compound locomotives having three pairs of cylinders and three groups of drivers—known as Triplex—have been built for very heavy freight service. The third group of drivers was located under the tender; two cylinders were high-pressure and four were low-pressure, the high-pressure pair driving the middle group of wheels. The right high-pressure cylinder supplied the rear pair of low-pressure cylinders in a similar manner. This arrangement did not prove entirely satisfactory because the extremely high steam capacity needed was not easily obtained.

Articulated locomotives now in service on American roads are invariably of the single-expansion type, the compound features having been done away with and four high-pressure cylinders employed. This arrangement permits operation at higher speeds and reduces the cost of maintenance. A number of roads have converted ex-

isting articulated locomotives from compounds to single expansions. While most single-expansion articulated locomotives are used in freight service, some are used in heavy passenger service where there are heavy grades.

Passenger Locomotives

Passenger locomotives, or those provided with a four-wheel lead truck to give greater security in rounding curves at the high speeds attained in modern passenger service, have two, three, or four pairs of driving wheels of large diameter generally 69 in. to 84 in. On many locomotives of earlier construction the rear frame supporting the firebox was carried on a two-wheel trailing truck, although most are now built with four-wheel trailing trucks. The types included in this class now in use on American railroads are: Atlantic—4-4-2, a few still are in service, Hudson—4-6-4; Pacific—4-6-2; Mountain—4-8-2 and Northern—4-8-4 type. The last three types are also often used for fast freight service. Ten-wheel—4-6-0 and some eight-wheel or American—4-4-0 passenger locomotives are also still in use on a few railroads. Other types, introduced in 1925 and 1926, are the 4-10-2 and 4-12-2 types, for both freight and passenger service, but none of these have been built lately.

The 4-6-0 type was introduced on the Philadelphia & Reading in 1847 and the first 4-8-0 type on the Baltimore & Ohio in 1856. This 4-8-0 type was intended for passenger service but subsequently nearly all locomotives with this wheel arrangement were built to haul freight trains.

A few passenger locomotives having a single pair of driving wheels, called the Bicycle type, have been built but as they were generally lacking in tractive force they were rebuilt into other types where they could perform more satisfactorily.

The 4-4-2-Atlantic type locomotive first appeared in 1888 when one was built to Geo. S. Strong's patents and used in high speed passenger service. As developed later, this type was a modification of the 2-4-2—Columbia type built in 1893 and the earlier eight-wheel—4-4-0—locomotive, first built in 1837. The latter for many years was standard on American railroads both for passenger and freight service and thus became known as the American type. The term "Atlantic" was derived from the fact that the 4-4-2 type was extensively used on the Atlantic Coast Line in 1895.

A further development produced the 4-4-4—Reading type of which a few were built in 1915 for the railroad bearing that name. This type never came into general use.

The 4-6-2—Pacific type locomotive is a development from the 4-4-2 type, simply having three pairs of driving wheels instead of two and consequently a larger boiler and firebox with the attendant increase in steam capacity and higher tractive force. A locomotive with this wheel arrangement was built by G. S. Strong in 1886 and used for a while on the Lehigh Valley. The next use was in 1901 by Baldwin Locomotive Works for some locomotives for New Zealand, followed in 1902 by some built by American Locomotive Company for the Missouri Pacific, hence the name. This type is used extensively in passenger service and sometimes in fast freight service.

The 4-6-4—Baltic or Hudson type was an evolution from the 4-6-2 type. It was first built in France in 1913 and introduced into the United States on the New York Central in 1927, having been designed by the American Locomotive Company.

The 4-8-2—Mountain type locomotive was first built in the year 1911 and used in passenger service on the mountain grades of the Clifton Forge Division of the Chesapeake & Ohio, hence the name. It was designed to provide a greater tractive force than could be obtained from the Pacific type and is similar to it but has an additional pair of driving wheels. The use of a very large boiler and firebox provides a high steam capacity. It is still in extensive use in heavy passenger service, also in fast freight service.

The 4-8-4 Northern type, an enlargement of the Mountain type, was first constructed in 1926 for the Northern Pacific, from which it takes its name. It was closely followed in 1927 by others for the Canadian National, Grand Trunk Western, Atchison, Topeka and Santa Fe and Delaware, Lackawanna and Western. Locomotives of this type have since been built for many other roads for use in both passenger and fast freight service and at present it is one of the most widely employed types.

Switching Locomotives

Switching locomotives are designed for varied service that requires a machine so proportioned that it will readily pass over the relatively sharp curves encountered in railroad yards, will start in either direction easily and quickly, and at the same time it must have ample tractive force to move heavy loads. To accomplish this the modern switching locomotive has its entire weight—except the coupled tender—resting on the axles of driving wheels of comparatively small diameter, the use of leading truck and trailing truck being dispensed with. Thus it secures the maximum amount of adhesion and tractive force from a given total weight of locomotive. The cylinder area and steam capacity are as great as consistent with the size of the locomotive. The wheel arrangement of this class of motive power as used by railroads generally consists of six or eight drivers, classified as 0-6-0 and 0-8-0 types respectively. Some very heavy units having ten drivers—0-10-0 or 0-10-2—have been built. For light service, chiefly in the yards of industrial works, switchers having only four drivers, 0-4-0, are used.

The type of switching locomotive generally used in railroad yards is equipped with an 8-wheel tender. Sometimes these were made with a sloping rear end so that the

engineman could have an unobstructed view to the rear as well as ahead of the engine. A tender light—similar to the locomotive headlight—is also placed on the rear. Many of the smaller switchers, 0-4-0, have fixed tenders built on the back of the cab. Sometimes this tender rests on an extension of the frames but more often on two or four trailing wheels. Articulated locomotives are also used by some roads for heavy yard switching, particularly for hump work.

Steam Locomotive Classification Systems

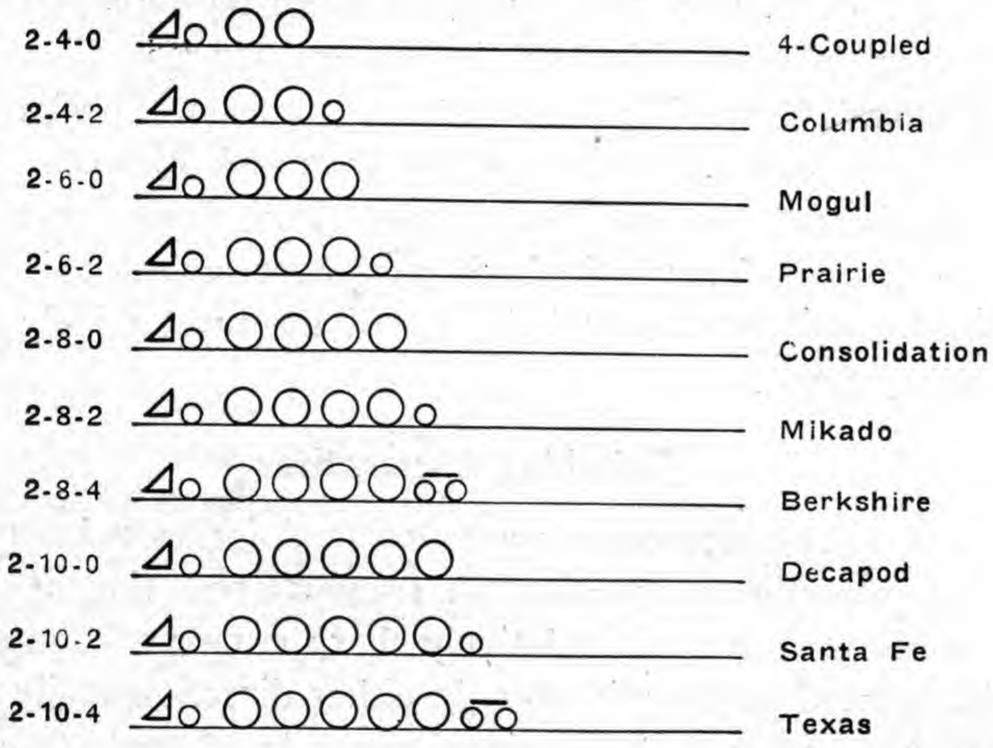
Various systems for the classification of steam locomotives have been proposed and are used to a greater or less extent. All are based on wheel or axle arrangements.

Whyte's System. The system commonly used in this country and in Great Britain is the one proposed by F. M. Whyte, Mechanical Engineer of the New York Central in 1900. In this system numerals are used to represent the number of wheels in each group starting at the front end, the first denoting the number of wheels in the leading truck, the second the number of drivers and the third the number of wheels in the trailing truck. In articulated locomotives a numeral is used for each group of drivers. The numerals are usually separated by hyphens. The diagrams and tables that follow show the application of this system to most types of locomotives now in use in the United States and Canada.

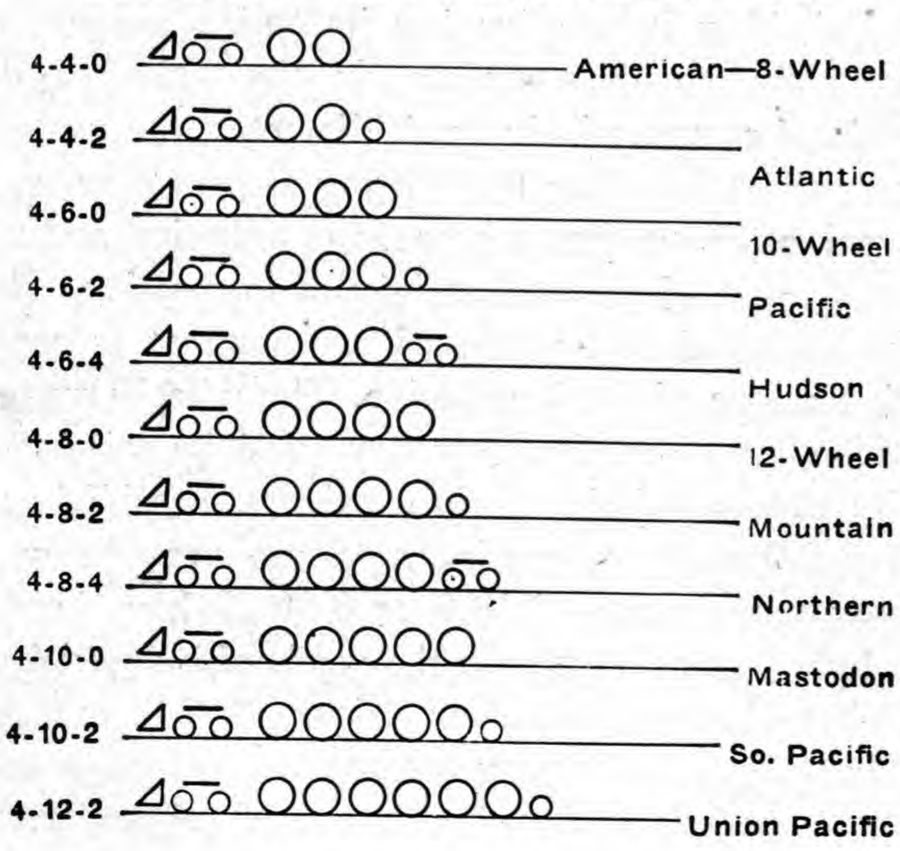
French System. This is similar to the Whyte system but the numerals denote axles instead of wheels. In this system a Pacific type would be classified as a 2-3-1 instead of a 4-6-2.

German or *Continental System.* In this system capital letters A.B.C.D. etc. are used to denote the number of pairs of coupled wheels or driving axles,—1, 2, 3, 4, etc., while numerals are used to denote the number of axles in the trucks. In the German system a Pacific type locomotive would be classified as a 2-C-1. In this system, should there be no leading or trailing truck, the numeral 0 is not employed as in the Whyte system. As examples, an Eight-Wheel Switcher is a Type D and a Ten-Wheel Locomotive a Type 2-C.

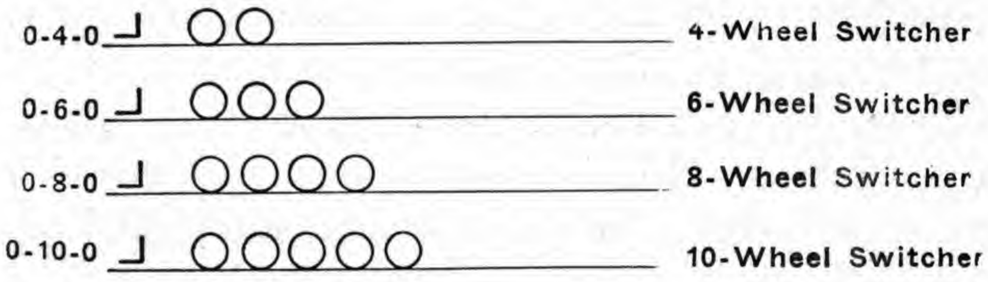
Locomotives with 2-Wheel Leading Trucks



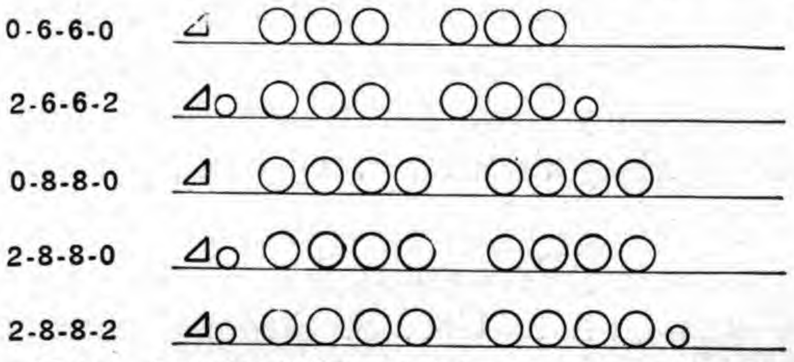
Locomotives with 4-Wheel Leading Trucks



Switching Locomotives

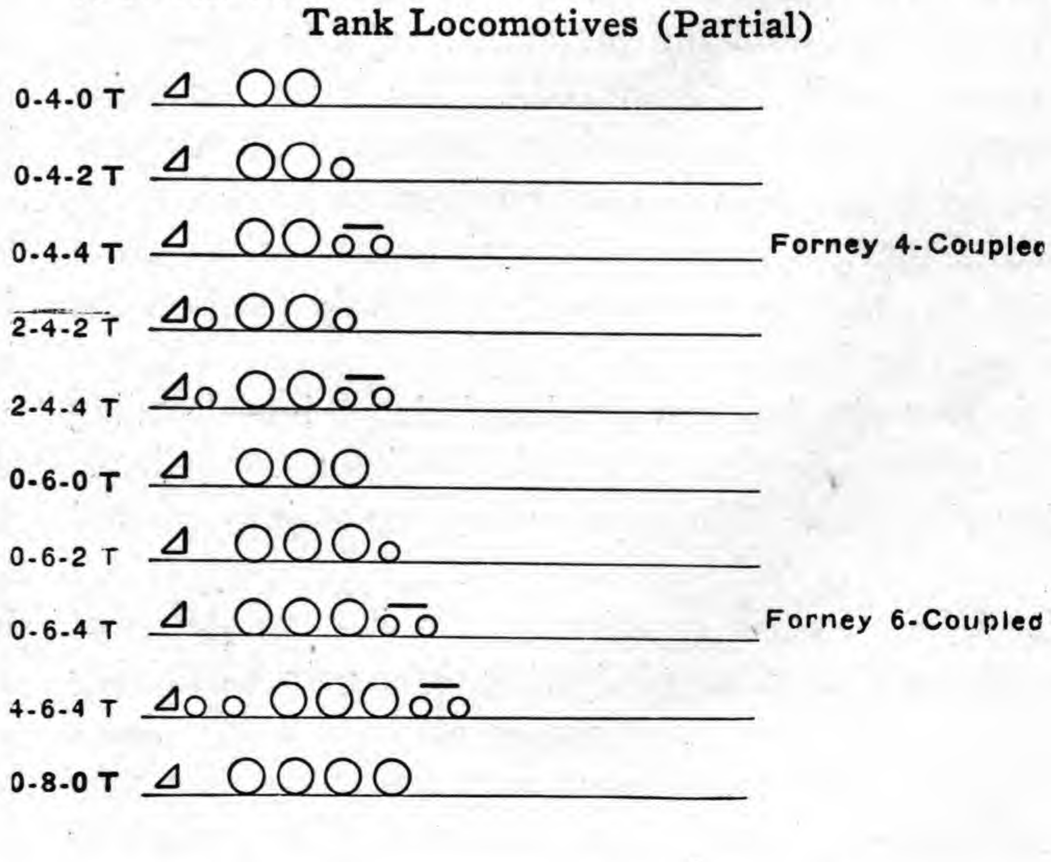


Articulated Locomotives (Partial)



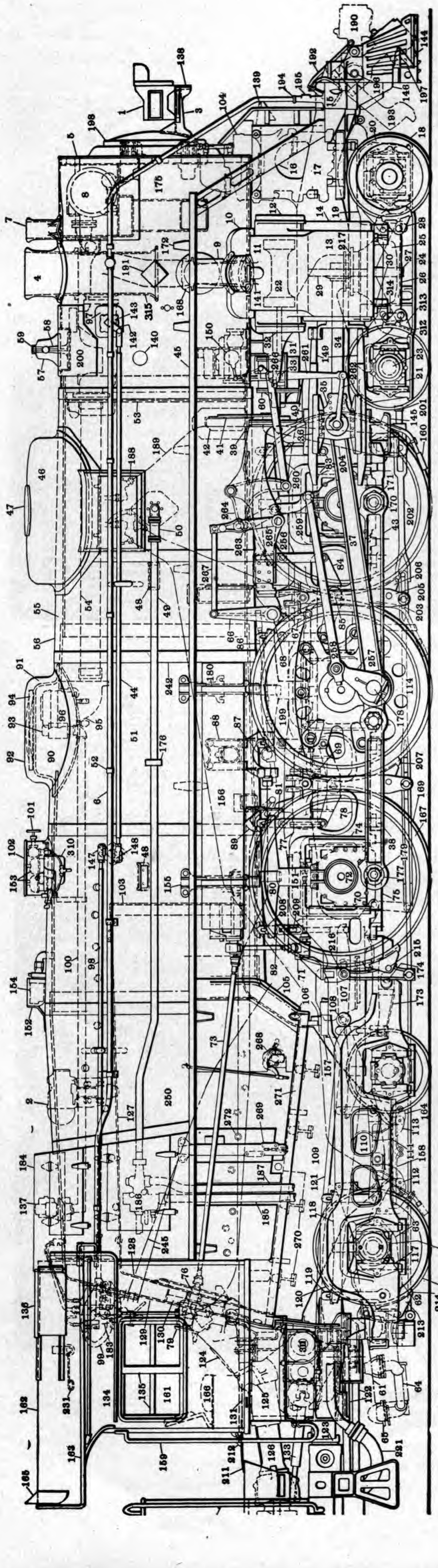
Note: Articulated Locomotives recently built have been of the following types: 2-6-6-2, 2-6-6-4, 2-6-6-6, 4-6-6-4, 2-8-8-2, 2-8-8-4, 4-8-8-2 and 4-8-8-4.

Tank Locomotives (Partial)



The Wall Street—Reading Co.
General Motors Diesel Electric Locomotive

Union Pacific
Fairbanks-Morse Diesel-Electric Locomotive



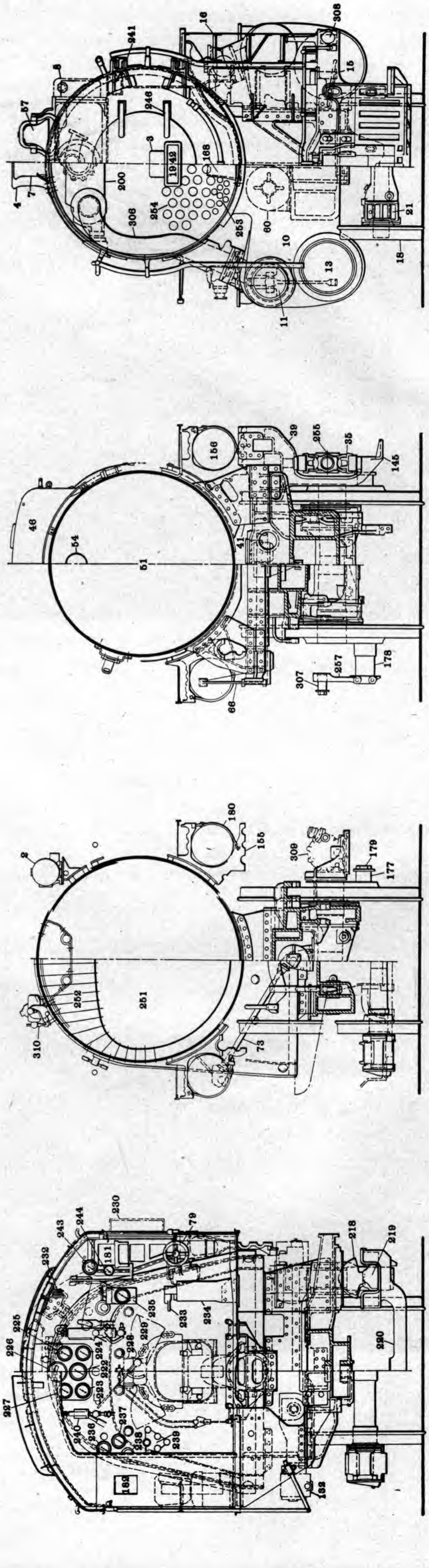
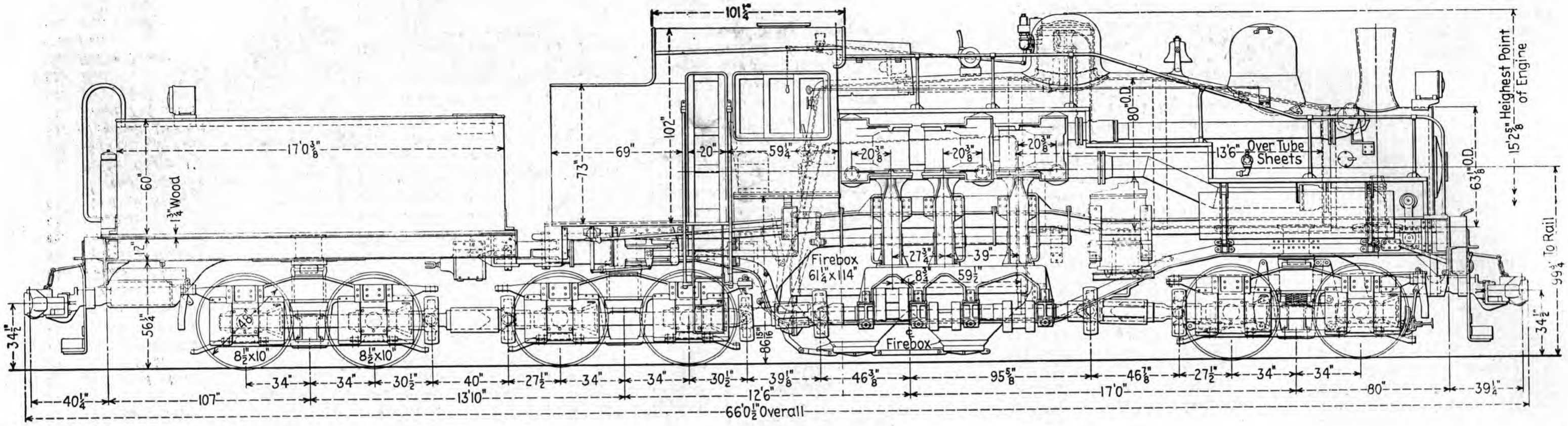


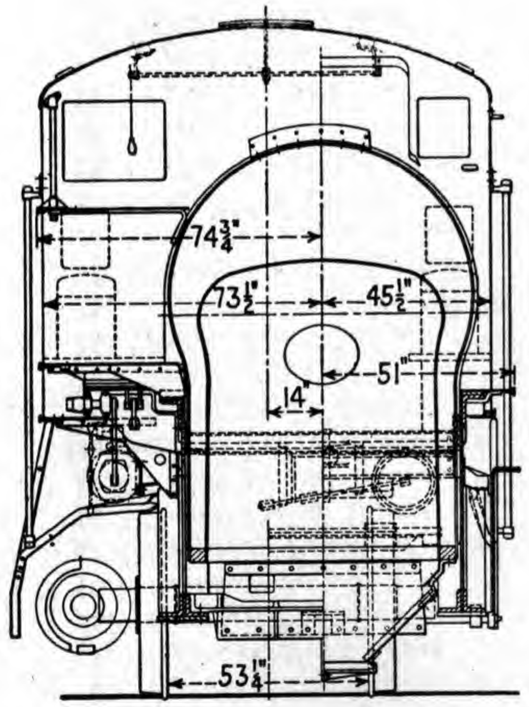
Diagram of a 4-6-4 or Hudson type passenger locomotive with principal parts numbered.

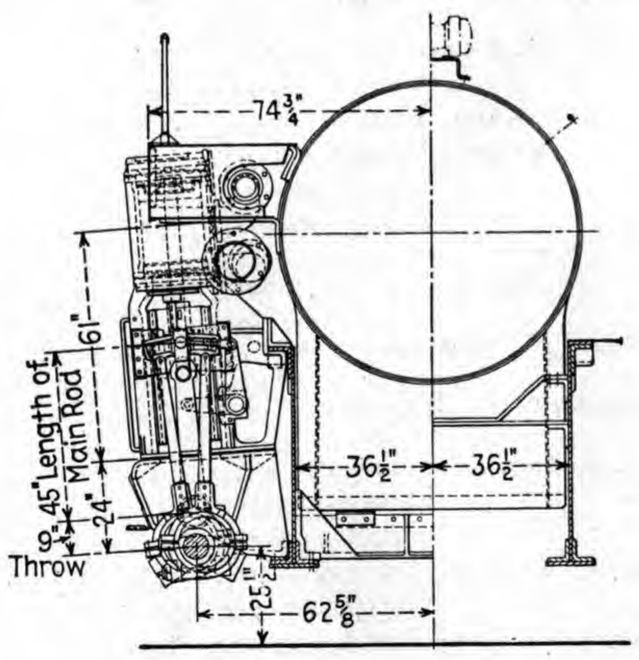
Diagram of a 4-6-4 or Hudson type passenger locomotive

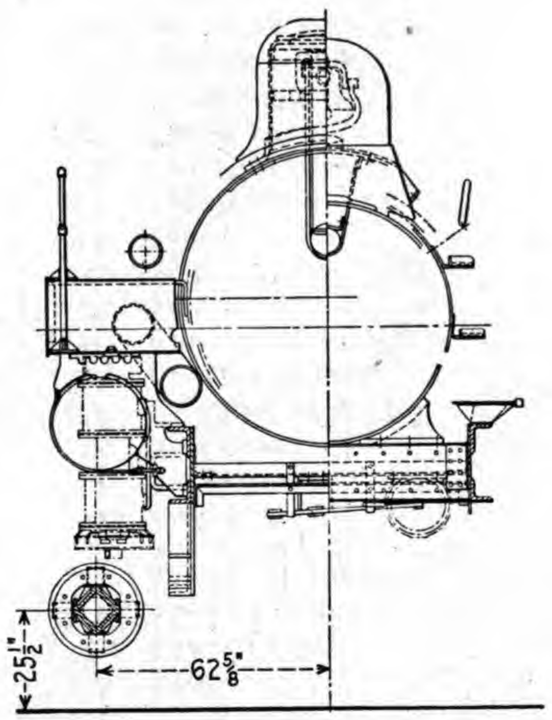
Names of Principal Parts of a Steam Locomotive

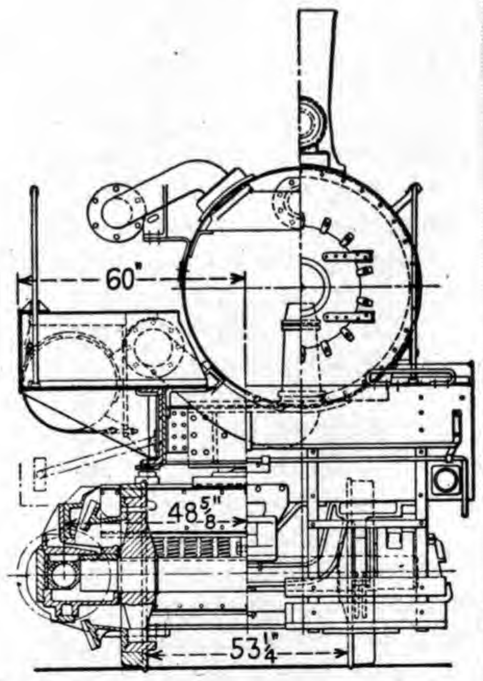
1. *Headlight*
2. *Headlight Turbo-Generator*
3. *Headlight Support*
4. *Smokestack*
5. *Smokebox Front*
6. *Handrail*
7. *Booster Exhaust Stack*
8. *Feedwater Heater*
9. *Steam Pipe Casing*
10. *Cylinder Saddle*
11. *Valve Chamber*
12. *Valve Chamber Head Cover*
13. *Cylinder*
14. *Cylinder Head Cover*
15. *Bumper*
16. *Front Steps*
17. *Front of Frame or Bed*
18. *Front Truck Wheel*
19. *Front Truck Frame*
20. *Front Truck Pedestal*
21. *Front Truck Journal Box*
22. *Piston Valve*
23. *Front Truck Axle*
24. *Front Truck Pedestal Tie Bar*
25. *Front Truck Transom*
26. *Front Truck Equalizer*
27. *Front Truck Spring*
28. *Front Truck Spring Hanger*
29. *Piston*
30. *Cylinder Cock*
31. *Valve Stem*
32. *Valve Stem Gland*
33. *Valve Stem Pin*
34. *Piston Rod*
35. *Crosshead*
36. *Crosshead Shoe*
37. *Main Rod*
38. *Side Rod—Rear*
39. *Guide Yoke*
40. *Guide Yoke Brace*
41. *Waist Sheet*
42. *Waist Sheet Connection*
43. *Side Rod—Front*
44. *Throttle Rod*
45. *Running Board*
46. *Sandbox*
47. *Sandbox Cap*
48. *Sandbox Step*
49. *Injector Delivery Pipe*
50. *Boiler Check Valve*
51. *Boiler*
52. *Handrail Bracket*
53. *Front Tubesheet*
54. *Drypipe*
55. *Boiler Lagging*
56. *Boiler Jacket*
57. *Bell*
58. *Bell Stand*
59. *Bell Yoke*
60. *Driver Brake Cylinder*
61. *Booster Engine*
62. *Booster Crank Case*
63. *Booster Gear Case*
64. *Booster Steam Pipe*
65. *Booster Steam Pipe Ball and Socket Joint*
66. *Reverse Shaft Arm*
67. *Reverse Shaft Lever*
68. *Reverse Shaft*
69. *Power Reverse Cylinder*
70. *Driving Box*
71. *Power Reverse Shaft Gear Box*
72. *Driving Axle*
73. *Power Reverse Operating Shaft*
74. *Frame Pedestal*
75. *Pedestal Binder*
76. *Power Reverse Operating Shaft Worm*
77. *Top Frame Rail (if separate frame)*
78. *Bottom Frame Rail (if separate frame)*
79. *Power Reverse Operating Handwheel*
80. *Driving Spring*
81. *Driving Spring Clip*
82. *Driving Spring Hanger*
83. *Driving Spring Hanger Pin*
84. *Driving Equalizer*
85. *Equalizer Fulcrum Pin—Driving*
86. *Valve Pilot Connecting Shaft*
87 *Valve Pilot Cam Box*
88. *Valve Pilot Cam Box Bracket*
89. *Valve Pilot Speed Recorder Wheel*
90. *Dome*
91. *Dome Lagging*
92. *Dome Casing*
93. *Turret Supply Steam Dryer*
94. *Dome Cover*
95. *Drypipe Elbow*
96. *Steam Dryer*
97. *Throttle Valve-Inside of Smokebox*
98. *Throttle Rod*
99. *Throttle Lever Quadrant*
100. *Turret Drypipe*
101. *Syphon Valve*
102. *Safety Valve Casing*
103. *Back Tubesheet*
104. *Air Compressor*
105. *Throat Sheet*
106. *Washout Plug*
107. *Driving and Trailing Truck Upper Equalizer*
108. *Driving and Trailing Truck Equalizer Fulcrum*
109. *Ashpan*
110. *Ashpan Hopper*
111. *Ashpan Hopper Slide Pull Link*
112. *Ashpan Hopper Dump Shaft*
113. *Ashpan Hopper Dump Shaft Bearing*
114. *Driving Wheel*
115. *Trailing Truck Wheel*
116. *Trailing Truck Journal Box*
117. *Trailing Truck Pedestal*
118. *Trailing Truck Spring*
119. *Trailing Truck Spring Hanger*
120. *Trailing Truck Frame*
121. *Rear Frame or Cradle*
122. *Drawbar*
123. *Chafing Plate*
124. *Stoker Elevator Conveyor*
125. *Stoker Intermediate Conveyor Ball Joint*
126. *Stoker Intermediate Conveyor*
127. *Crownsheet*
128. *Backsheet*
129. *Backhead of Boiler*
130. *Firedoor Opening*
131. *Foot Board or Deck*
132. *Stoker Engine*
133. *Stoker Drive Shaft*
134. *Cab*
135. *Cab Window Sash*
136. *Cab Ventilator*
137. *Turret*
138. *Number Plate*
139. *Headlight Step*
140. *Inspection Hole Cover*
141. *Steam Chest Relief Valve Base*
142. *Throttle Cam Shaft Arm*
143. *Throttle Stuffing Box*
144. *Pilot*
145. *Crosshead Step*
146. *Pilot Bracket*
147. *Throttle Clevis*
148. *Throttle Rod Equalizer*
149. *Guide*
150. *Mechanical Lubricator*
151. *Driving Box Spring Saddle*
152. *Whistle Shield*
153. *Safety Valve*
154. *Whistle*
155. *Main Reservoir Bracket*
156. *Main Air Reservoir*
157. *Expansion Bracket or Pad*
158. *Ashpan Hopper Slide*
159. *Cab Handhole*
160. *Sand Pipe Outlet*
161. *Cab Window Opening*
162. *Cab Roof*
163. *Cab Roof Water Gutter*
164. *Ashpan Dump Shaft Arm*
165. *Cab Smoke Deflector*
166. *Cab Seat*
167. *Driving Wheel Tire*
168. *Exhaust Nozzle*
169. *Driving Wheel Flange*
170. *Front Crank Pin*
171. *Front Crank Pin Nut*
172. *Running Board Bracket*
173. *Driving and Trailing Truck Lower Equalizer*
174. *Driving and Trailing Truck Equalizer Pin*
175. *Smokebox*
176. *Injector Delivery Pipe Bracket*
177. *Rear Crank Pin*
178. *Main Crank Pin*
179. *Rear Crank Pin Nut*
180. *Main Reservoir Hanger*
181. *Cab Front Window*
182. *Cab Rear Window*
183. *Throttle Lever*
184. *Turret Cover*
185. *Suction or Feed Pipe*
186. *Injector*
187. *Injector Overflow Pipe*
188. *Sander*
189. *Sand Pipe*
190. *Pilot Drop Coupler*
191. *Builder's Name Plate*
192. *Uncoupling Rod*
193. *Coupler Counterweight*
194. *Flag Staff*
195. *Signal Lamp Bracket*
196. *Drop Coupler Pivot*
197. *Pilot Step*
198. *Smokebox Door*
199. *Counterbalance*
200. *Superheater Header and Throttle*
201. *Driver Brake Rod Adjuster*
202. *Driver Brake Pull Rod*
203. *Driver Brake Beam*
204. *Driver Brake Lever*
205. *Driver Brake Hanger*
206. *Driver Brake Shoe Head*
207. *Driver Brake Shoe*
208. *Driving Spring Hanger Gib*
209. *Transverse Equalizer*
211. *Cab Apron*
212. *Cab Apron Hinge*
213. *Trailing Truck Brake Shoe Head*
214. *Trailing Truck Brake Shoe*
215. *Brake Head Pin*
216. *Brake Hanger Pin*
217. *Front Truck Center Plate*
218. *Trailing Truck Centering Device Rocker*
219. *Trailing Truck Centering Device Base*
220. *Trailing Truck Transom*
221. *Tank Water Hose*
222. *Main Steam Gage*
223. *Water Pump Steam Gage*
224. *Tender Water Level Gage*
225. *Booster Steam Gage*
226. *Pyrometer for Superheated Steam*
227. *Train Steamheat Gage*
228. *Firebox Door Operating Cylinder*
229. *Firebox Door*
230. *Windshield*
231. *Whistle Lever*
232. *Whistle Lever Support*
233. *Brake Valve*
234. *Brake Valve Pedestal*
235. *Valve Pilot Speed Recorder and Cutoff Gage*
236. *Stoker Engine Steam Gage*
237. *Stoker Single Pointer Jet Gage*
238. *Stoker Double Pointer Jet Gage*
239. *Stoker Distributor Jet Manifold and Control Valves*
240. *Water Gage Glass*
241. *Front-End Hinge*
242. *Boiler Jacket Band*
243. *Duplex Air Brake Gage*
244. *Independent Air Brake Gage*
245. *Arch Tubes*
246. *Smokebox Door Hinge*
250. *Firebox*
251. *Combustion Chamber*
252. *Staybolts*
253. *Boiler Tubes*
254. *Superheater Flues*
255. *Wrist Pin*
256. *Valve Gear Frame*
257. *Eccentric Crank*
258. *Eccentric Rod*
259. *Valve Gear Arm*
260. *Valve Rod*
261. *Combination Lever*
262. *Union Link*
263. *Reverse Yoke*
264. *Bell Crank*
265. *Radius Bar*
266. *Valve Crosshead*
267. *Valve Gear Reach Rod*
268. *Blowoff Cock*
269. *Pipe Bracket*
270. *Ashpan Side Support*
271. *Mud Ring*
272. *Combustion Holes*
306. *Steam Pipe*
307. *Eccentric Crank Pin*
308. *Push Pole Pocket*
309. *Boiler Feedwater Pump*
310. *Low Water Alarm*
311. *Equalizing Reservoir*
312. *Front Truck Brake Shoe*
313. *Front Truck Brake Head*
314. *Front Truck Brake Hanger*
315. *Smokestack Extension*

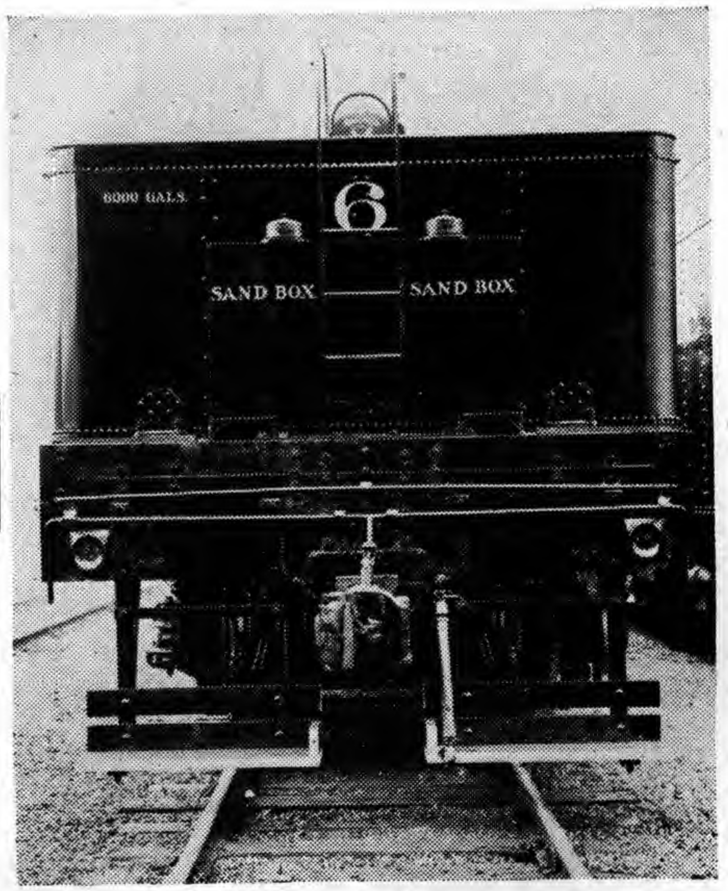












Rear View of the Tender.

Western Maryland Shay Geared Locomotive—Elevation and Cross Sections. Built by Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

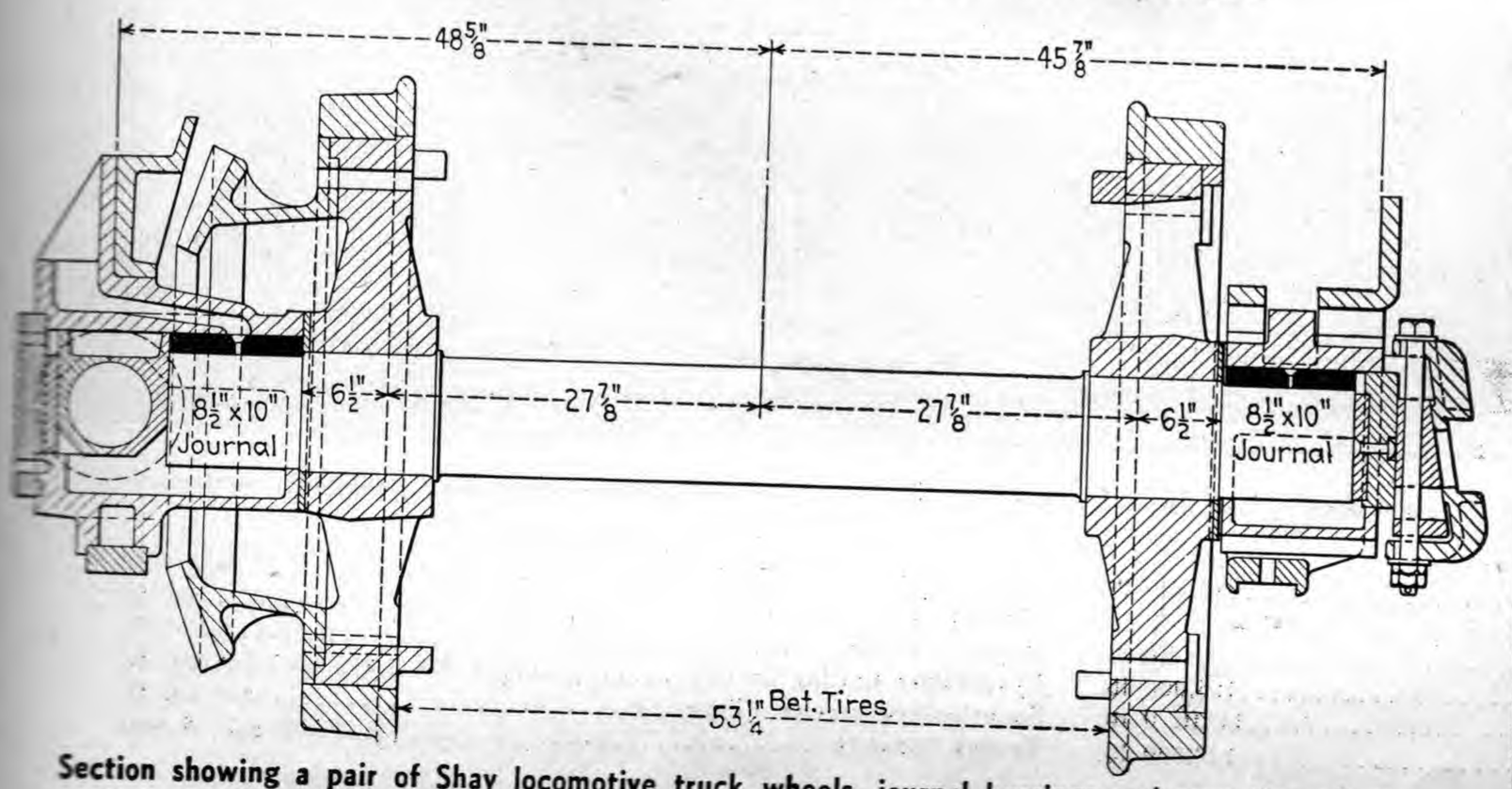
Tractive force	59,740 lb.	Fuel	Soft coal
Cylinders, diameter and stroke (three)	17 in. x 18 in.	Grate area	48.5 sq. ft.
Drivers, diameter	48 in.	Steam pressure	200 lb.
Weight	324,000 lb.	Evaporative heating surface	226 + 1623 — 1849 sq. ft.
Wheel base, truck	5 ft. 8 in.	Superheating surface (Type A)	401 sq. ft.
Wheel base, engine and tender	49 ft. 0 in.	Tender capacity	6000 gal., 9 tons

Descriptions: *Railway Mechanical Engineer*, December 1945; *Railway Age*, October 6, 1945.

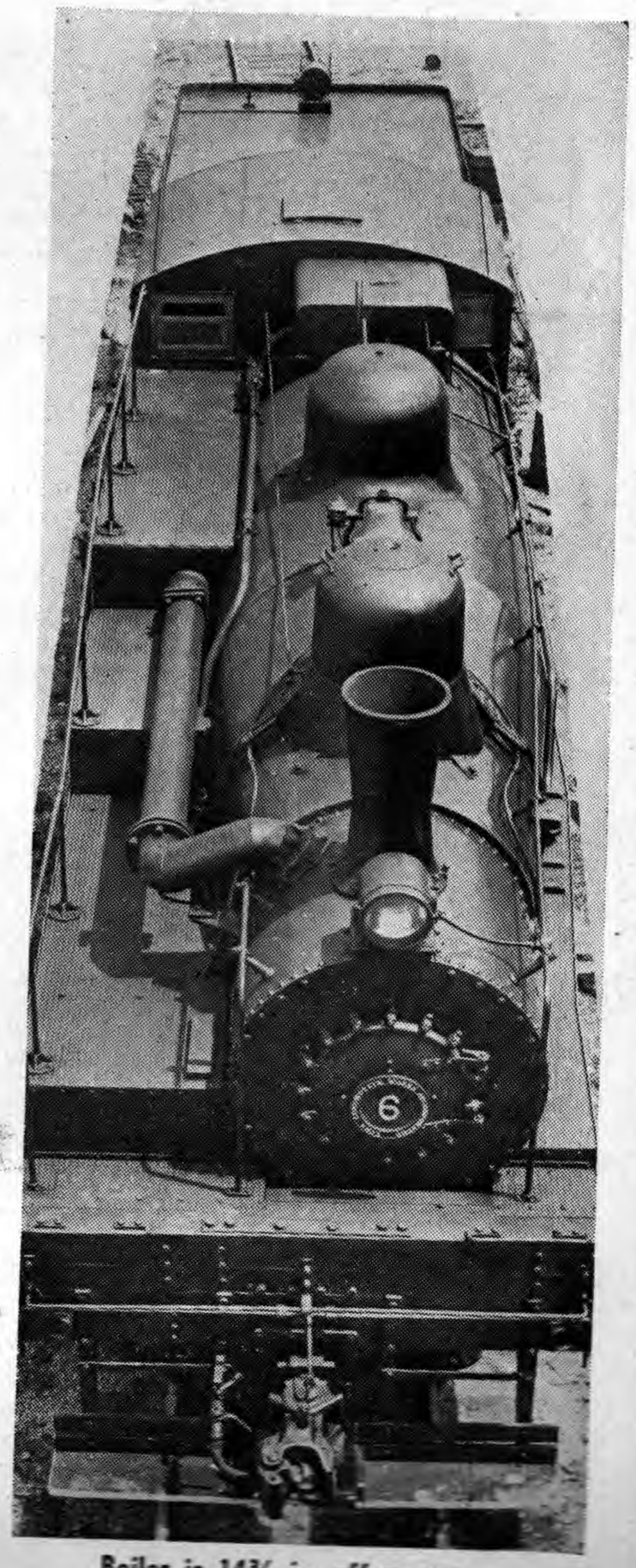
(See also opposite page)

Right side of Western Maryland locomotive showing three-cylinder vertical engine and drive shaft arrangement. Built by Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

Tender tank is supported at two points—Truck and hinge connection to engine.



Section showing a pair of Shay locomotive truck wheels, journal bearings and mounting of gear on a steel-tired wheel.



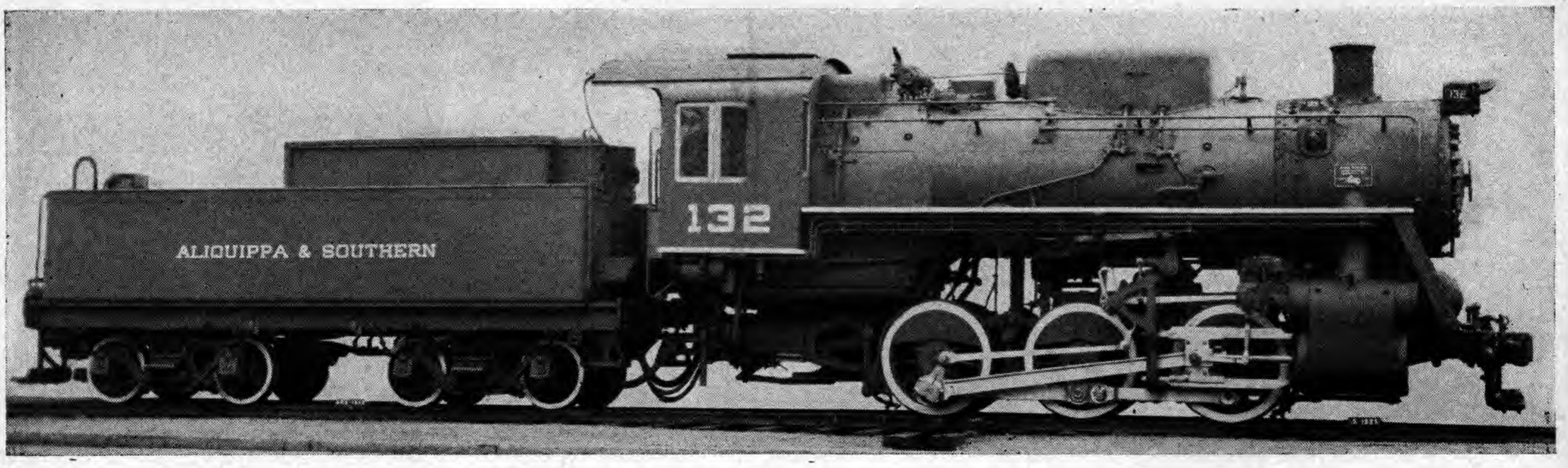
Boiler is 14¾ in. off center.

Lehigh & New England 0-6-0 (Six-Wheel) Switching Locomotive, Road Class B-5. Built by The Baldwin Locomotive Works.

Tractive force	44,200 lb.	Fuel	Soft coal
Cylinders, diameter and stroke	21 in. x 28 in.	Grate area	49.2 sq. ft.
Weight on drivers	183,900 lb.	Steam pressure	215 lb.
Drivers, diameter	51 in.	Evaporative heating surface	205 + 1646.6 — 1851.6 sq. ft.
Driving wheel base	11 ft. 0 in.	Superheating surface (Type A)	485 sq. ft.
Weight of tender, loaded	148,760 lb.	Tender capacity	8,000 gal., 10 tons

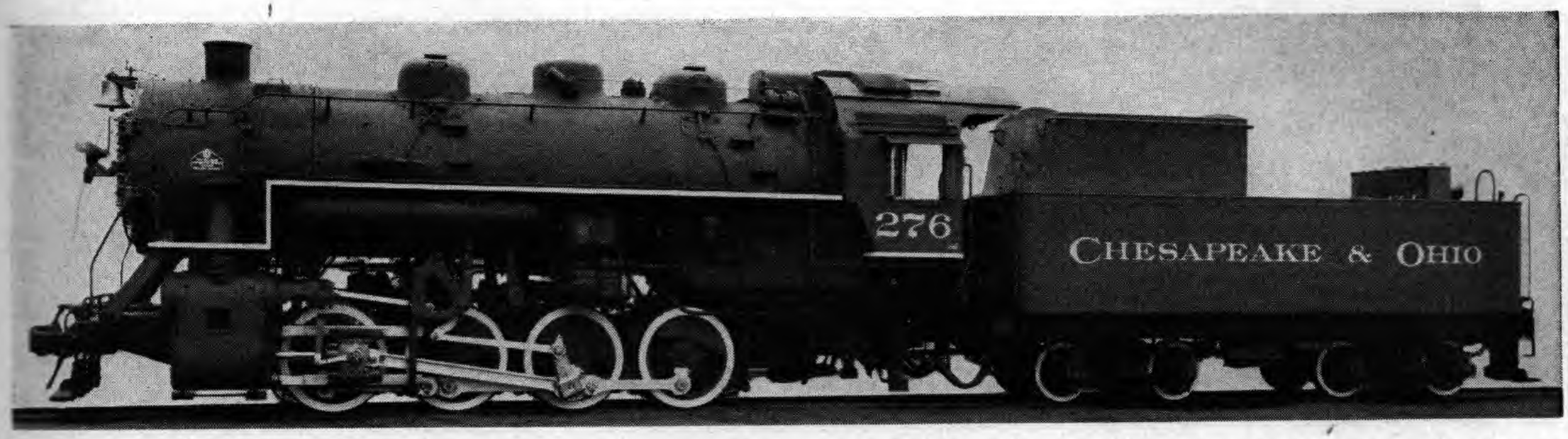
Wheeling & Lake Erie 0-6-0 (Six-Wheel) Switching Locomotive, Road Class B-5. Road Nos. 3981-3986. Built by the American Locomotive Company.

Tractive force	41,200 lb.	Fuel	Soft coal
Cylinders, diameter and stroke	21 in. x 28 in.	Grate area	33.1 sq. ft.
Drivers, diameter	51 in.	Steam pressure	200 lb.
Weight on drivers	168,000 lb.	Evaporative heating surface	152 + 1,671 = 1,823 sq. ft.
Driving wheel base	11 ft. 0 in.	Superheating surface (Type A)	435 sq. ft.
Weight of tender, loaded	163,100 lb.	Tender capacity	8,950 gal., 12½ tons



Aliquippa & Southern 0-6-0 (Six-Wheel) Switching Locomotive. Built by the American Locomotive Company.

Tractive force	42,900 lb.	Fuel	Soft coal
Cylinders, diameter and stroke	22 in. x 28 in.	Grate area	33.1 sq. ft.
Drivers, diameter	51 in.	Steam pressure	190 lb.
Weight on drivers	165,000 lb.	Evaporative heating surface	152 + 1,412 — 1,564 sq. ft.
Driving wheel base	11 ft. 0 in.	Superheating service (Type A)	419 sq. ft.
Weight of tender, loaded	122,000 lb.	Tender capacity	6,000 gal., 8 tons

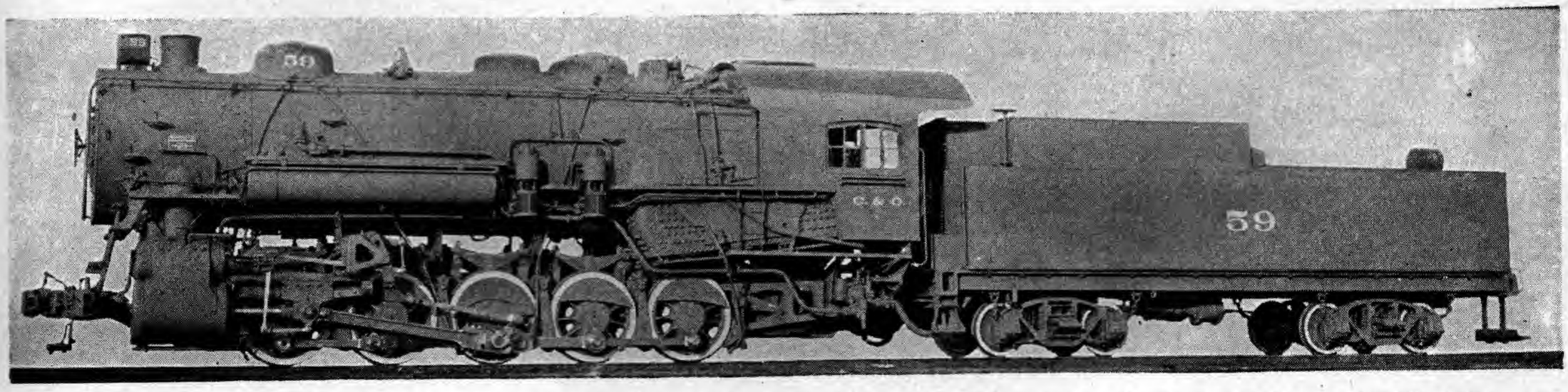


Chesapeake & Ohio 0-8-0 (Eight-Wheel) Switching Locomotive, Class C-16; Road Nos. 255-284. Tender Class 8-RE. Built by The Baldwin Locomotive Works.

Tractive force	57,200 lb.	Fuel	Soft coal
Cylinders, diameter and stroke	25 in. x 28 in.	Grate area	47 sq. ft.
Drivers, diameter	52 in.	Steam pressure	200 lb.
Weight on drivers	247,000 lb.	Evaporative heating surface	210 + 2,360 = 2,570 sq. ft.
Weight of tender, loaded	159,200 lb.	Superheating surface (Type A)	637 sq. ft.
Driving wheel base	15 ft. 0 in.	Tender capacity	8,000 gal., 12 tons

New York Central (P. & L. E.) 0-8-0 (Eight-Wheel) Switching Locomotive, Class U-3-L; Road Nos. 8050-8074. Built by the American Locomotive Company.

Tractive force	54,350 lb.	Fuel	Soft coal
Cylinders, diameter and stroke	25 in. x 28 in.	Grate area	47 sq. ft.
Drivers, diameter	52 in.	Steam pressure	190 lb.
Weight on drivers	234,000 lb.	Evaporative heating surface	202 + 2,568 — 2,770 sq. ft.
Driving wheel base	15 ft. 0 in.	Superheating surface (Type A)	639 sq. ft.
Weight of tender, loaded	188,000 lb.	Tender capacity	10,000 gal., 16 tons

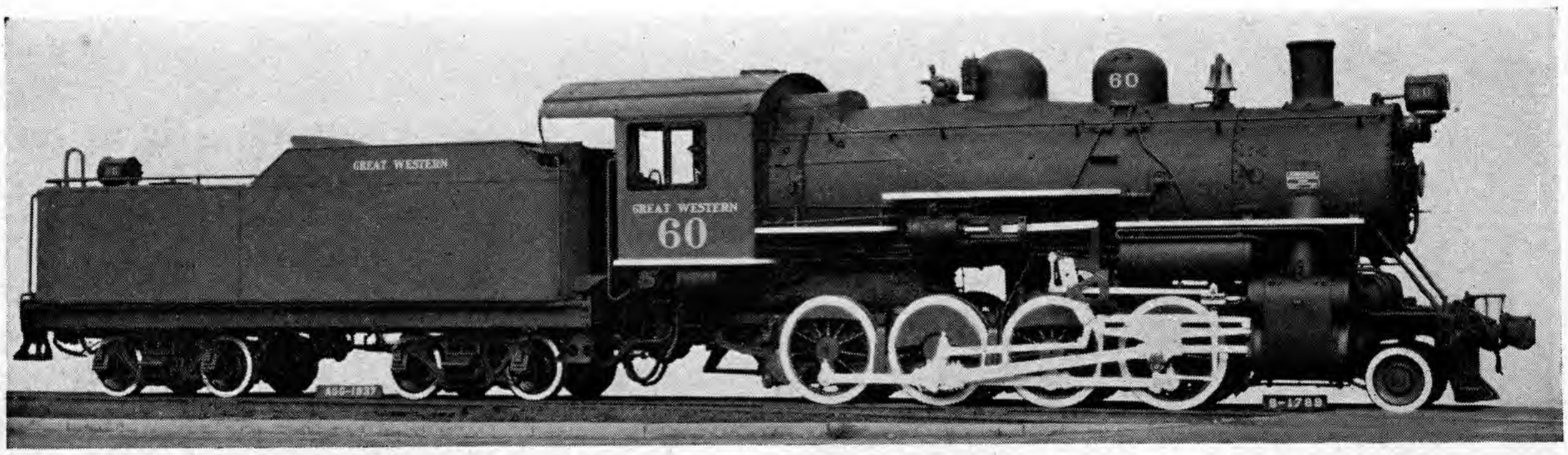


Chesapeake & Ohio 0-10-0 (Ten-Wheel) Switching Locomotive; New Road Nos. 130-144. Built by the American Locomotive Company.

Tractive force	63,000 lb.	Fuel	Soft Coal
Cylinders, diameter and stroke	27 in. x 28 in.	Grate area	72.3 sq. ft.
Drivers, diameter	51 in.	Steam pressure	185 lb.
Weight on drivers	296,000 lb.	Evaporative heating surface	232 + 3,466 — 3,698 sq. ft.
Driving wheel base	19 ft. 0 in.	Superheating surface (Type A)	935 sq. ft.
Weight of tender, loaded	185,700 lb.	Tender capacity	10,000 gal., 15 tons

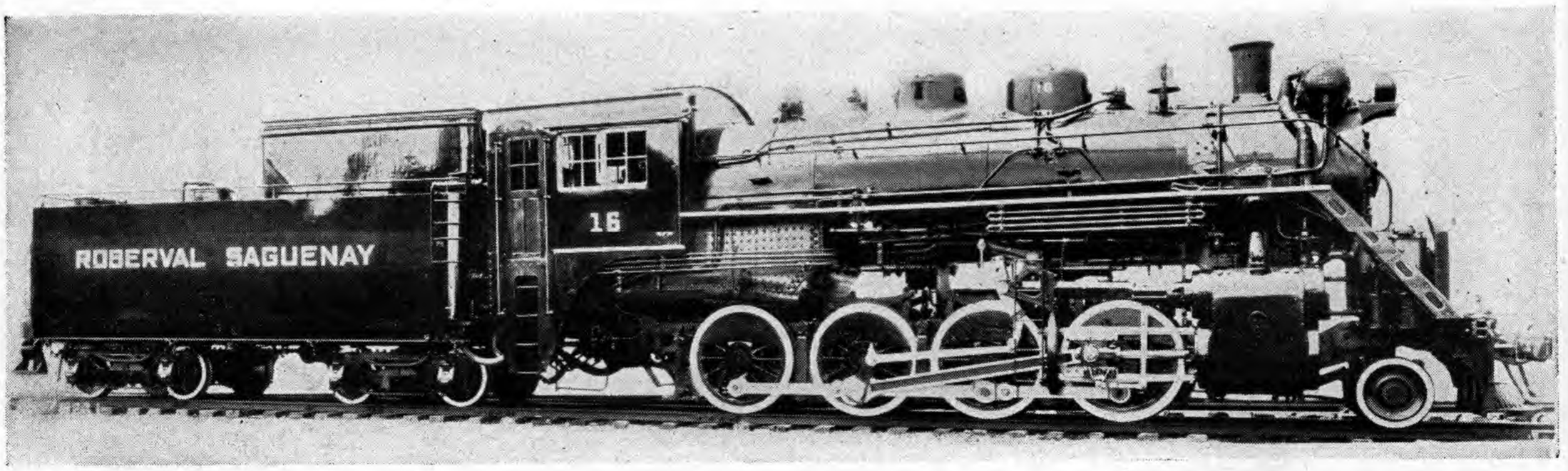
Bangor & Aroostook 2-8-0 (Consolidation) Type Locomotive. Class G-2, Road Nos. 400-404. Built by the American Locomotive Company.

Rated tractive force	45,085 lb.
Cylinders, diameter and stroke	22¼ in. x 30 in.
Drivers, diameter	63 in.
Weight on drivers	198,400 lb.
Weight on front truck	40,400 lb.
Total weight of engine	238,800 lb.
Weight of tender, loaded	162,240 lb.
Driving wheel base	16 ft. 9 in.
Total engine wheel base	26 ft. 6 in.
Fuel	Soft coal
Grate area	50.8 sq. ft.
Steam pressure	225 lb.
Evaporative heating surface	211 + 2,425 — 2,636 sq. ft.
Superheating surface	426 sq. ft.
Tender capacity	8,500 gal., 12 tons



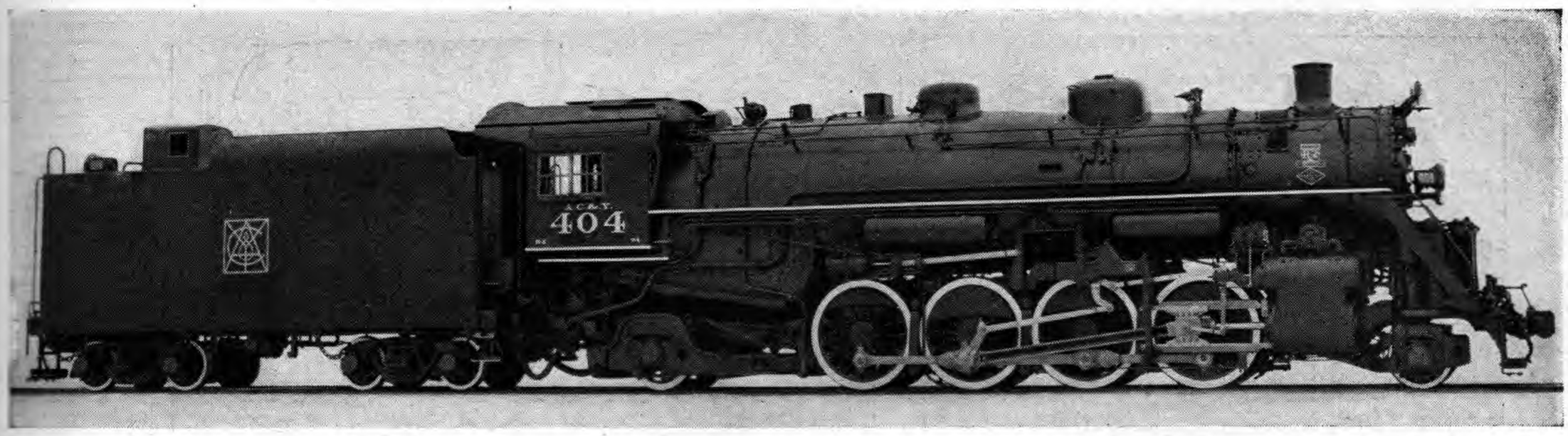
Great Western of Denver 2-8-0 (Consolidation) Type Locomotive for freight service. Built by the American Locomotive Company.

Rated tractive force	31,290 lb.
Cylinders, diameter and stroke	19 in. x 26 in.
Drivers, diameter	51 in.
Weight on drivers	141,500 lb.
Weight on front truck	19,500 lb.
Total weight of engine	161,000 lb.
Weight of tender	149,600 lb.
Boiler diameter, inside	66 in.
Driving wheel base	14 ft. 0 in.
Total engine wheel base	22 ft. 4 in.
Fuel	Semi-Bit. coai
Grate area	30.1 sq. ft.
Steam pressure	200 lb.
Evaporative heating surface	158 + 1,516 — 1,674 sq. ft.
Superheating surface (Type A)	416 sq. ft.
Tender capacity	8,000 gal. water, 12 tons coal



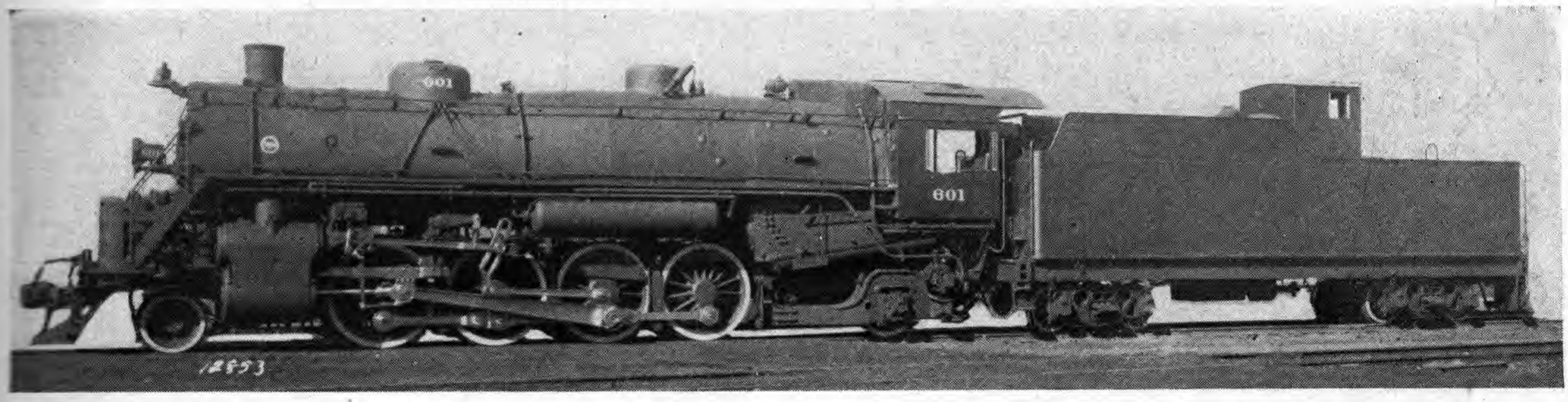
Roberval Saguenay 2-8-0 (Consolidation) Type Locomotive for freight service. Built by the Canadian Locomotive Company, Ltd.

Tractive force	47,300 lb.
Cylinders, diameter and stroke	23 in. x 30 in.
Drivers, diameter	57 in.
Weight on drivers	204,200 lb.
Weight on front truck	26,520 lb.
Total weight of engine	230,720 lb.
Weight of tender	171,000 lb.
Diameter of boiler	71 in.
Driving wheel base	15 ft. 10 in.
Total engine wheel base	25 ft. 3 in.
Fuel	Soft coal
Grate area	50.2 sq. ft.
Steam pressure	200 lb.
Evaporative heating surface	193 + 2,117 = 2,310 sq. ft.
Superheating surface (Type A)	564 sq. ft.
Tender capacity	7,000 Imp. gal., 14 tons



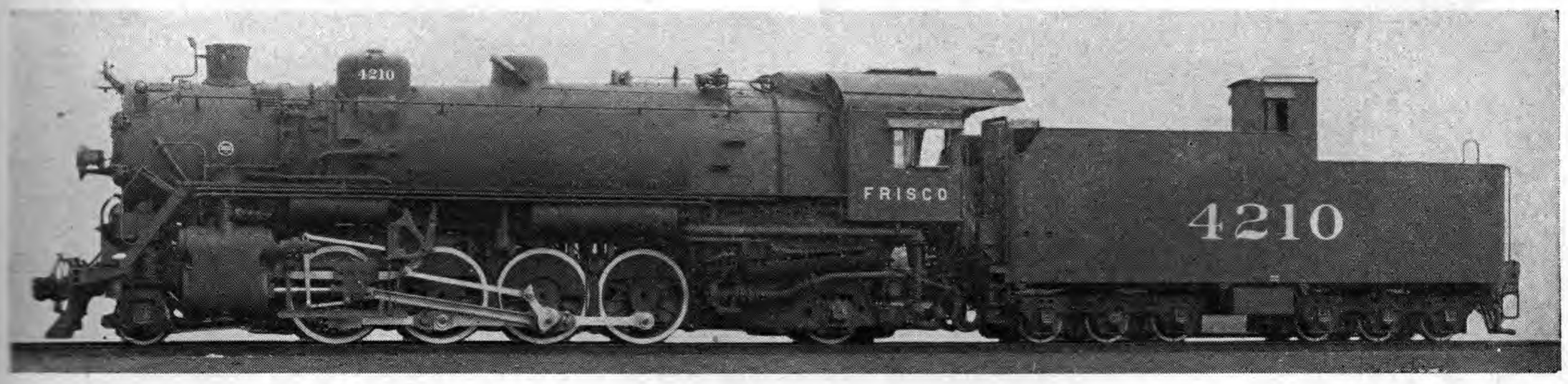
Akron, Canton & Youngstown 2-8-2 (Mikado) Type Locomotive for freight service, Class R-2, Road Nos. 404, 405. Built by the Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

Tractive force	53,800 lb.	Driving wheel base	16 ft. 9 in.
Cylinders, diameter and stroke	26 in. x 30 in.	Total engine wheel base	37 ft. 4 in.
Drivers, diameter	64 in.	Fuel	Soft coal
Weight on drivers	227,500 lb.	Grate area	66.7 sq. ft.
Weight on front truck	35,800 lb.	Steam pressure	200 lb.
Weight on trailing truck	56,400 lb.	Evaporative heating surface	343 + 3,164 — 3,507 sq. ft.
Total weight of engine	319,700 lb.	Superheating surface (Type A)	972 sq. ft.
Weight of tender, ⅔ loaded	176,733 lb.	Tender capacity	12,400 gal., 16 tons



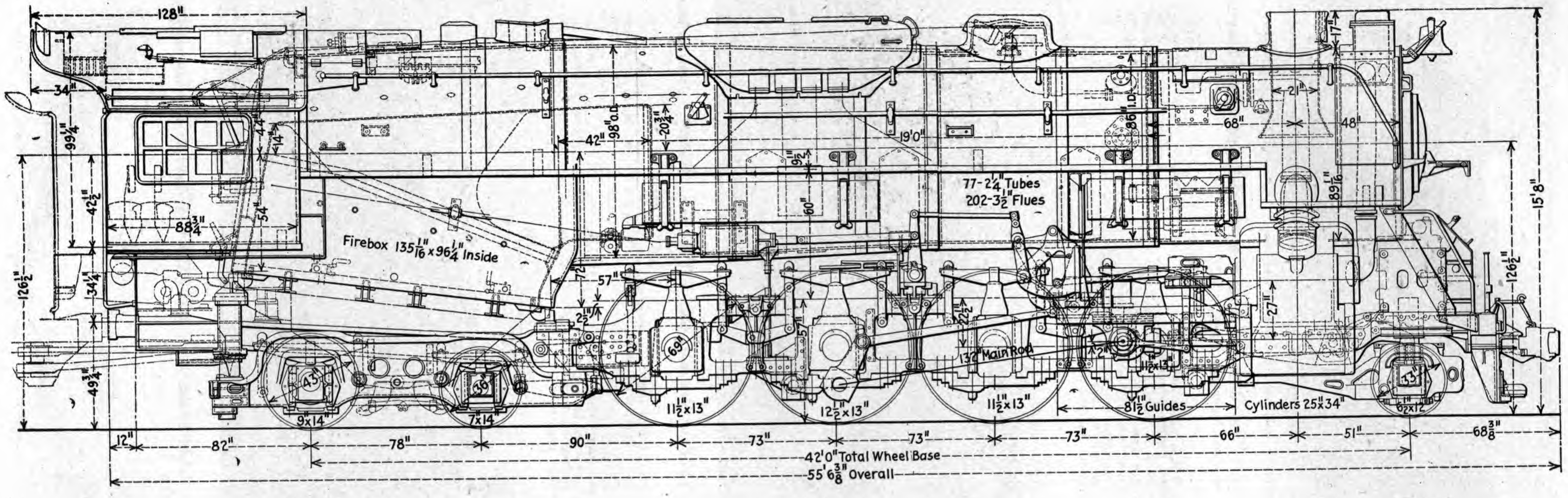
Kansas, Oklahoma & Gulf 2-8-2 (Mikado) Type Locomotive for freight service, Road Nos. 601, 602. Built by The Baldwin Locomotive Works.

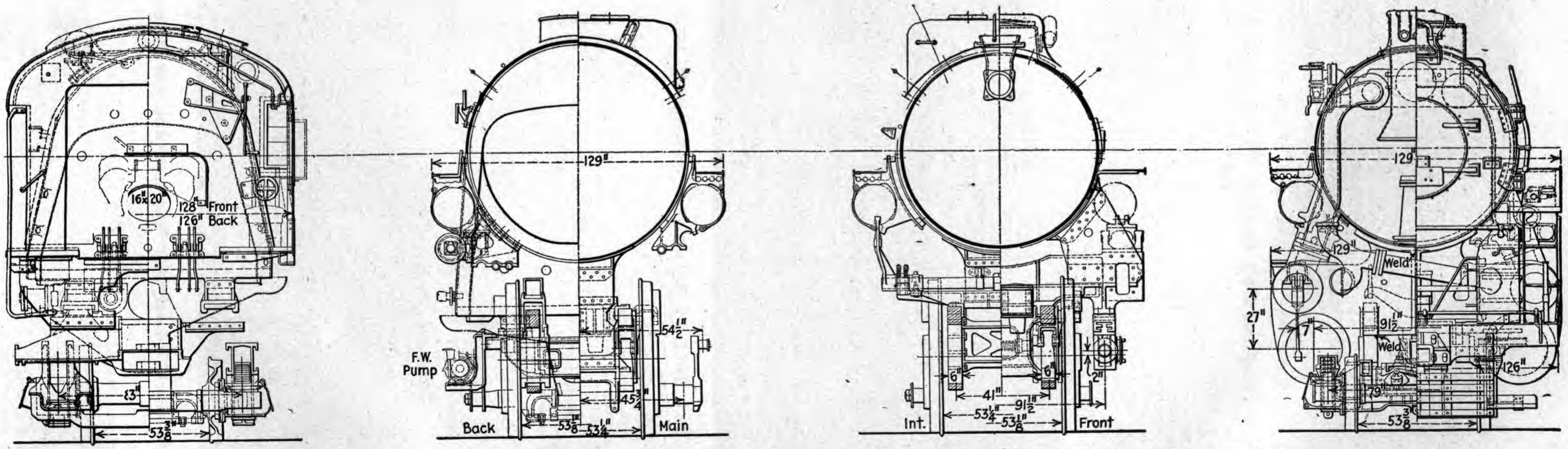
Tractive force	54,800 lb.	Driving wheel base	16 ft. 9 in.
Cylinders, diameter and stroke	26 in. x 30 in.	Total engine wheel base	36 ft. 11 in.
Drivers, diameter	63 in.	Fuel	Soft coal
Weight on drivers	223,500 lb.	Grate area	66.7 sq. ft.
Weight on front truck	27,000 lb.	Steam pressure	200 lb.
Weight on trailing truck	49,000 lb.	Evaporative heating surface	340 + 3,222 = 3,562 sq. ft.
Total weight of engine	299,500 lb.	Superheating surface (Type A)	1,002 sq. ft.
Weight of tender, 2/3 load	182,500 lb.	Tender capacity	12,000 gal., 16 tons



St. Louis-San Francisco 2-8-2 (Mikado) Type Locomotive with Booster for freight service; Road Nos. 4200-4219. Built by The Baldwin Locomotive Works.

Tractive force, engine	66,700 lb.	Driving wheel base	16 ft. 9 in.
Tractive force, booster	11,700 lb.	Total engine wheel base	37 ft. 7 in.
Cylinders, diameter and stroke	27 in. x 32 in.	Fuel	Soft coal
Drivers, diameter	63 in.	Grate area	80.3 sq. ft.
Weight on drivers	274,690 lb.	Steam pressure	230 lb.
Weight on front truck	37,000 lb.	Evaporative heating surface	390 + 3,994 — 4.384 sq. ft.
Weight on trailing truck	64,100 lb.	Superheating surface (Type E)	1,920 sq. ft.
Total weight of engine	375,790 lb.	Tender capacity	10,000 gal., 17 tons



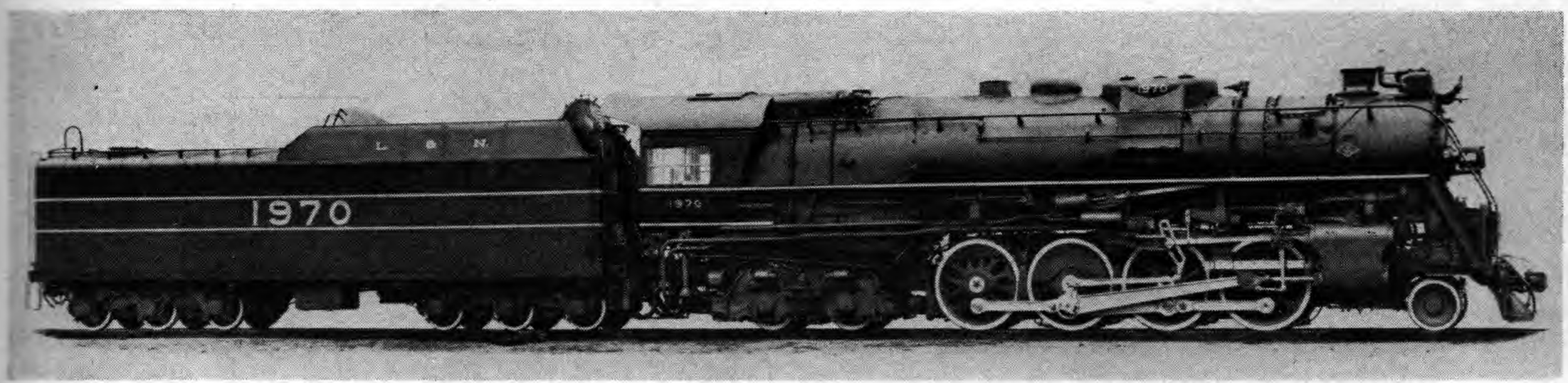


New York, Chicago St. Louis (Nickel Plate) 2-8-4 Type Locomotive, Class S, Road Nos. 700-714—Elevation and cross sections.

Slight changes were made in later orders

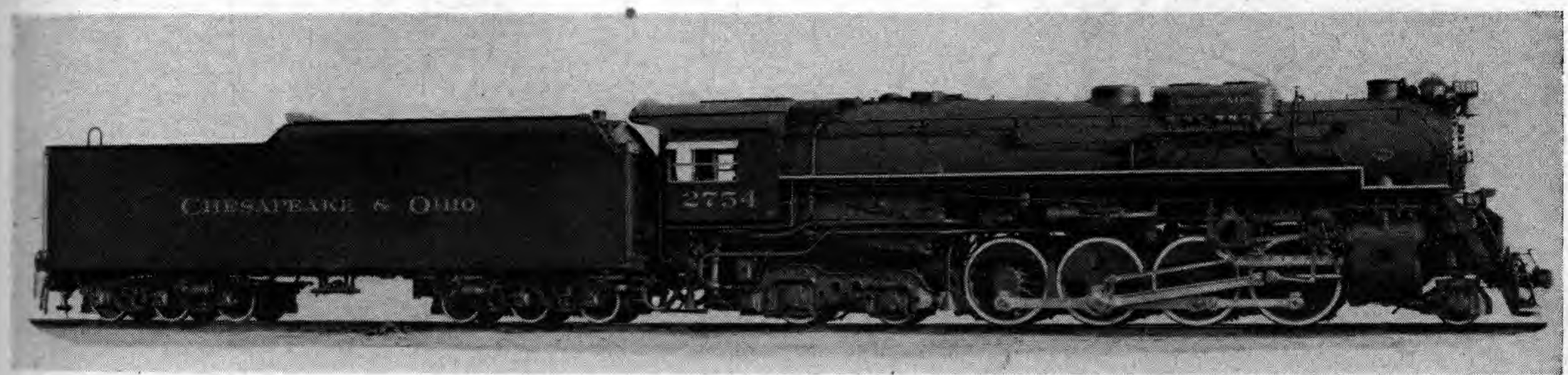
(Description: ***Railway Mechanical Engineer***, November, 1934; *Railway Age*, November 17, 1934)

(See also opposite page)



Louisville & Nashville 2-8-4 Type Locomotive, Class M-1, with Booster for freight service; Class M-1, Road Nos. 1970-1991. Built by the Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

Tractive force, engine	65,290 lb.
Tractive force, booster	14,000 lb.
Cylinders, diameter and stroke	25 in. x 32 in.
Drivers, diameter	69 in.
Weight on drivers	267,500 lb.
Weight on front truck	52,900 lb.
Weight on trailing truck	127,700 lb.
Total weight of engine	448,100 lb.
Weight of tender, ⅔ load	308,900 lb.
Driving wheel base	18 ft. 3 in.
Total engine wheel base	42 ft. 4 in.
Fuel	Soft coal
Grate area	90.2 sq. ft.
Steam pressure	265 lb.
Evaporative heating surfaces	463 + 4,190 = 4,653 sq. ft.
Superheating surface (Type E)	1,908 sq. ft.
Tender capacity	22,000 gal., 25 tons



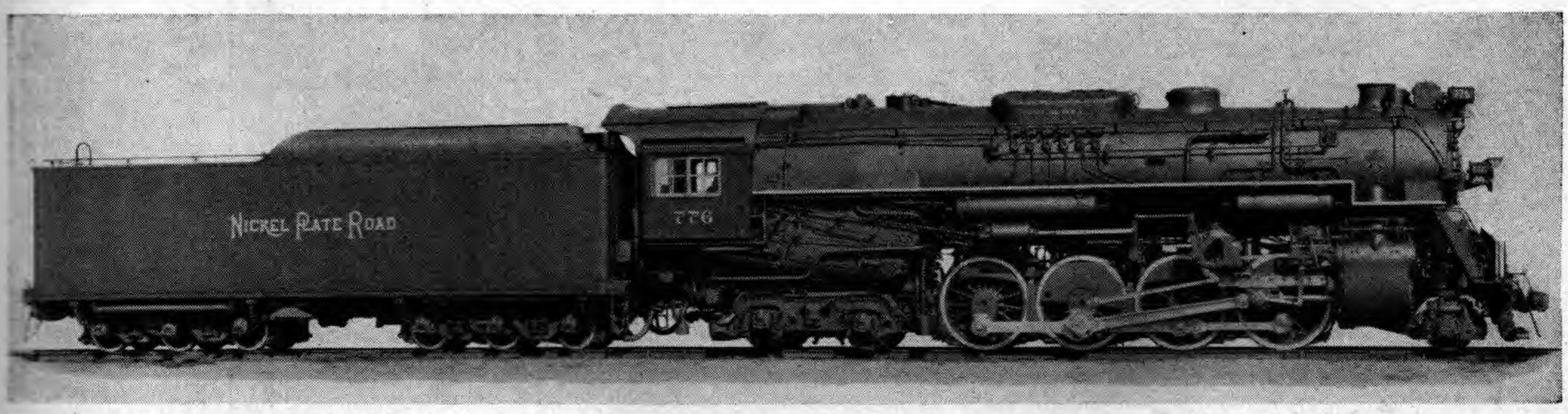
Chesapeake & Ohio 2-8-4 Type Locomotive, Class K-4, Road Nos. 2750-2759 (Earlier Lots Nos. 2700-2749). Built by the Lima Locomotive Works.

(Description: *Railway Mechanical Engineer,* March, 1936)

Tractive force, engine	69,350 lb.
Tractive force, booster	14,000 lb.
Cylinders, diameter and stroke	26 in. x 34 in.
Drivers, diameter	69 in.
Weight on drivers	293,100 lb.
Weight on front truck	48,500 lb.
Weight on trailing truck	128,080 lb.
Total weight of engine	489,680 lb.
Weight of tender, ⅔ loaded	315,770 lb.
Driving wheel base	18 ft. 3 in.
Total engine wheel base	42 ft. 0 in.
Fuel	Soft coal
Firebox, length and width	135 1/16 in. x 96¼ in.
Grate area	90.3 sq. ft.
Diameter of boiler, outside	87 15/16 in.
Steam pressure	245 lb.
Evaporative heating surface	407 + 4,308 = 4,715 sq. ft.
Superheating surface (Type E)	1,932 sq. ft.
Tender capacity	21,000 gal., 30 tons

Descriptions: *Railway Mechanical Engineer,* August 1944; *Railway Age,* July 29, 1944.

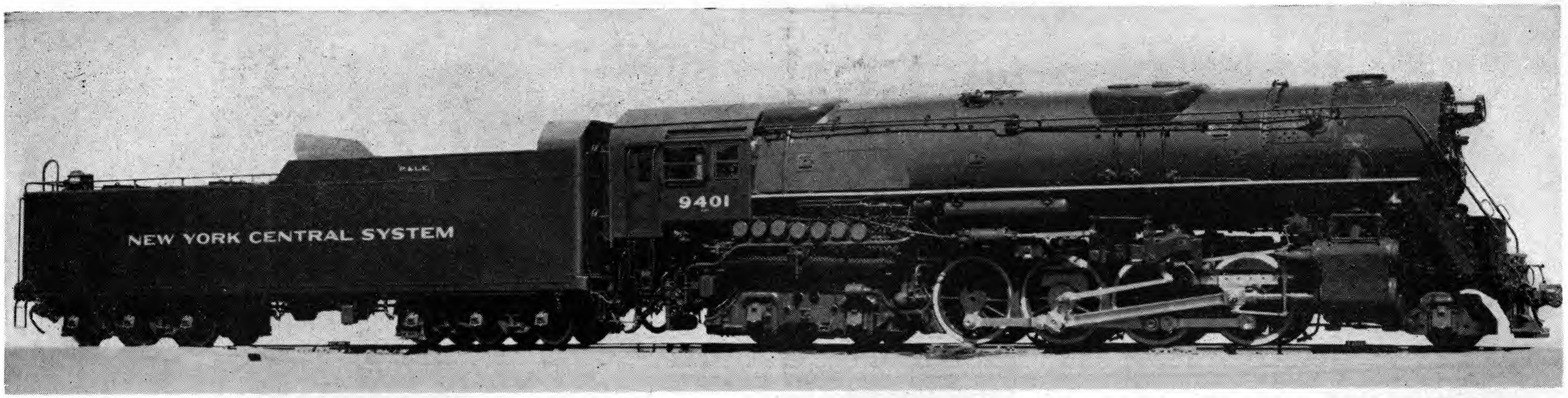
Note: Locomotives of essentially same design were built for Pere Marquette, Nos. 1201-1239, *and Virginian, No.* 500-509



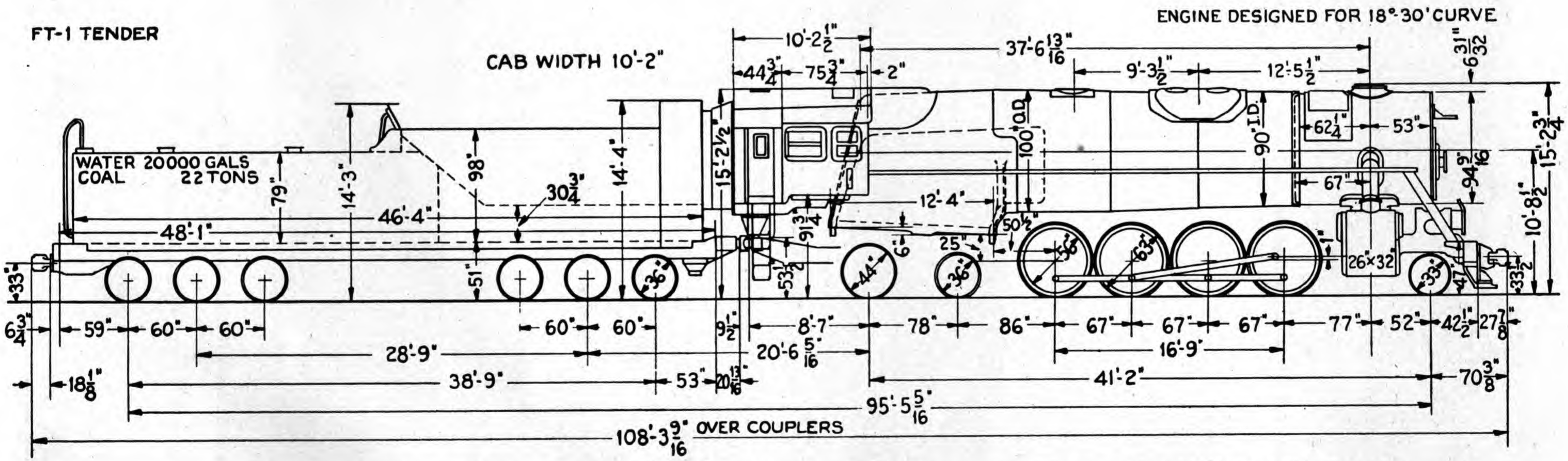
New York, Chicago & St. Louis (Nickel Plate) 2-8-4 Type Locomotive, Class S-3, for freight service; Road Nos. 770-779 (Earlier Lots Nos, 700-769). Built by the Lima Locomotive Yorks, Inc., Division of Lima-Hamilton Corp.

(Description, earlier lot: *Railway Mechanical Engineer,* November, 1934)

Cylinders, diameter and stroke	25 in. x 34 in.
Tractive force	64,100 lb.
Drivers, diameter	69 in.
Weight on drivers	266,030 lb.
Weight on front truck	55,040 lb.
Weight on trailing truck	123,220 lb.
Total weight of engine	444,290 lb.
Weight of tender, ⅔ loaded	288,840 lb.
Driving wheel base	18 ft. 3 in.
Total engine wheel base	42 ft. 0 in.
Fuel	Soft coal
Firebox, length and width	135 1/16 in. x 96¼ in.
Grate area	90.3 sq. ft.
Diameter of boiler, inside	87 15/16 in.
Steam pressure	245 lb.
Evaporative heating surface	461 + 4,311 = 4,772 sq. ft.
Superheating surface (Type E)	1,932 sq. ft.
Tender capacity	22,000 gal., 22 tons

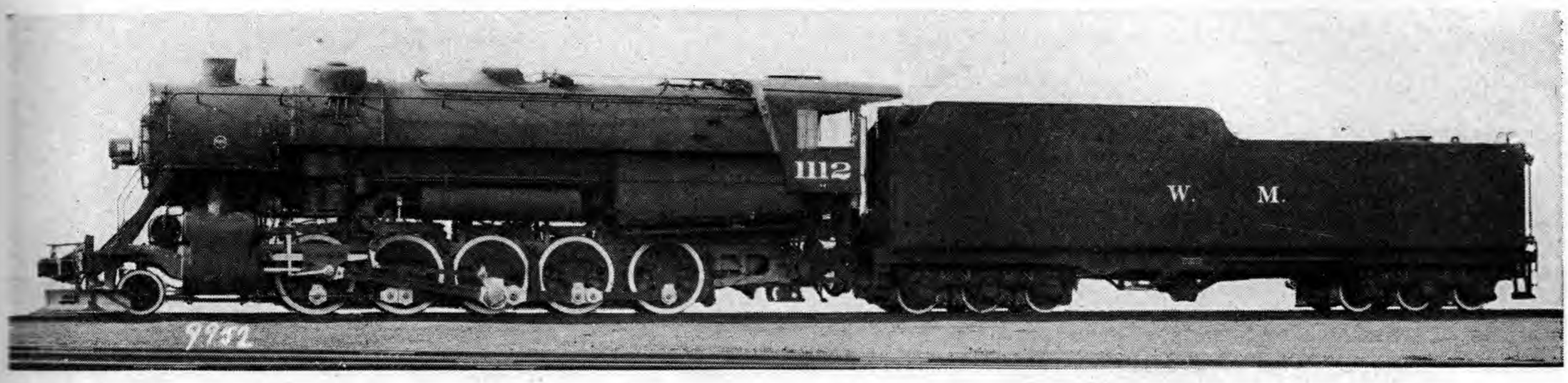


New York Central System (Pittsburgh & Lake Erie) 2-8-4 Type Locomotive for heavy freight trains loaded with coal and iron ore. Class A-2-A, Road Nos. 9400-9406. Built by the American Locomotive Company.



Diagrammatic elevation of the New York Central System (Pittsburgh & Lake Erie) heavy freight locomotive, 2-8-4 type, Class A-2-A, Road Nos. 9400-9406.

Rated tractive force	67,130 lb.	Weight on trailing truck	108,000 lb.	Firebox, length and width	135 1/16 in. x 96 1/4 in.
Cylinders, diameter and stroke	26 in. x 32 in.	Total weight of engine	426,000 lb.	Grate area	90.3 sq. ft.
Drivers, diameter	63 in.	Weight of tender	352,780 lb.	Steam pressure	230 lb.
Weight on drivers	280,000 lb.	Driving wheel base	16 ft. 9 in.	Evaporative heating surface	388 + 3,888 = 4,276 sq. ft.
Weight on front truck	38,000 lb.	Total engine wheel base	41 ft. 2 in.	Superheating surface (Type E)	1,881 sq. ft.
		Fuel	Soft coal	Tender capacity	20,000 gal. water, 22 tons coal

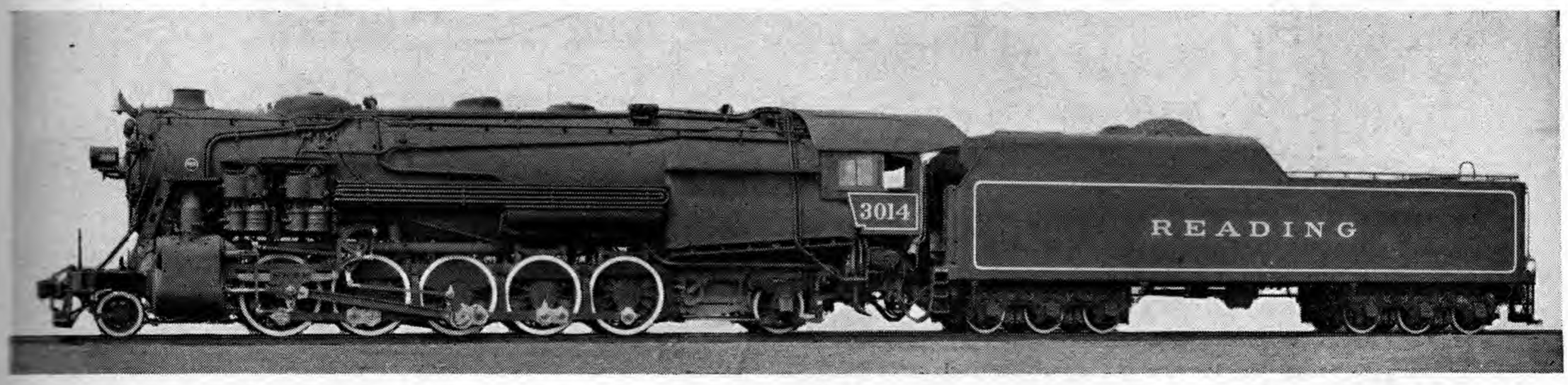


Western Maryland 2-10-0 (Decapod) Locomotive, Class 1-2, for freight service; Road Nos. 1111-1130. Built by The Baldwin Locomotive Works.

Tractive force	90,300 lb.
Cylinders, diameter and stroke	30 in. x 32 in.
Boiler diameter	92 in.
Drivers, diameter	61 in.
Weight on drivers	386,800 lb.
Weight on front truck	32,480 lb.
Total weight of engine	419,280 lb.
Weight of tender	415,920 lb.
Driving wheel base	26 ft. 6 in.
Total engine wheel base	33 ft. 1 in.
Fuel	Soft coal
Grate area	104.5 sq. ft.
Steam pressure	240 lb.
Evaporative heating surface	360 + 4,071 = 4,431 sq. ft.
Superheating surface (Type A)	1,248 sq. ft.
Tender capacity	22,000 gal., 30 tons

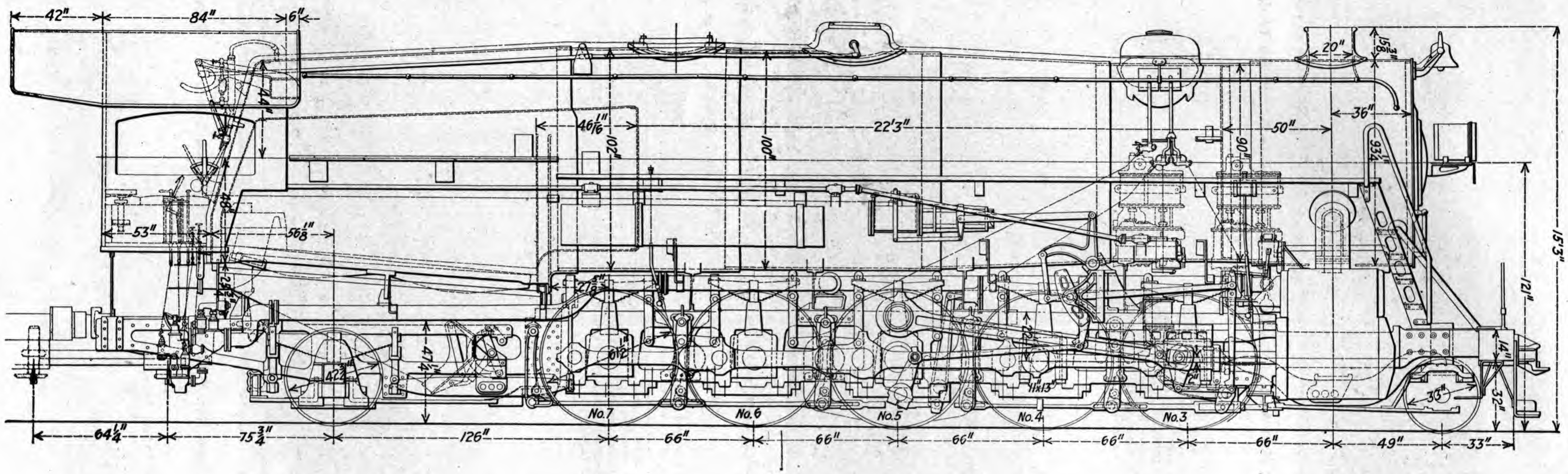
Chicago & Illinois Midland 2-10-2 (Santa Fe) Type Locomotive for freight service, Class H-1; Road Nos. 700-703. Built by the Lima Locomotive Works, Inc.

Tractive force, engine	77,700 lb.
Tractive force, booster	10,500 lb.
Cylinders, diameter and stroke	30 in. x 32 in.
Drivers, diameter	63 in.
Weight on drivers	321,700 lb.
Weight on front truck	20,700 lb.
Weight on trailing truck	63,200 lb.
Total weight of engine	405,600 lb.
Driving wheel base	24 ft. 4 in.
Total engine wheel base	42 ft. 6 in.
Fuel	Soft coal
Grate area	88.2 sq. ft.
Steam pressure	200 lb.
Evaporative heating surface	528 + 4,342 — 4,870 sq. ft.
Superheating surface (Type A)	1,230 sq. ft.
Tender capacity	12,000 gal., 16 tons

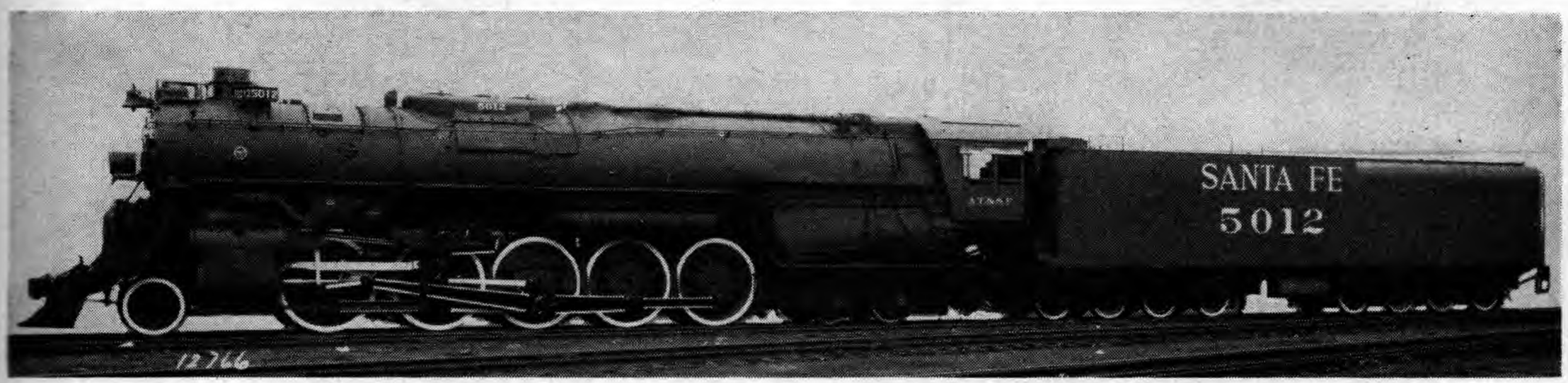


Reading 2-10-2 (Santa Fe) Type Locomotive for freight service, Class K-1-SB; Road Nos. 3011-3020. Built by The Baldwin Locomotive Works.

Tractive force	92,500 lb.
Cylinders, diameter and stroke	30½ in. x 32 in.
Drivers, diameter	61½ in.
Weight on drivers	363,900 lb.
Weight on front truck	30,000 lb.
Weight on trailing truck	57,100 lb.
Total weight of engine	451,000 lb.
Weight of tender, loaded	360,100 lb.
Driving wheel base	22 ft. 0 in.
Total engine wheel base	42 ft. 1 in.
Fuel	Ant. and Bit. mix.
Grate area	108¼ sq. ft.
Steam pressure	225 lb.
Evaporative heating surface	439 + 5,033 = 5,472 sq. ft.
Superheating surface (Type A)	1,840 sq. ft.
Tender capacity	19,000 gal., 26 tons



Reading 2-10-2 (Santa Fe) Type Locomotive. No. 3000, for freight service— Elevations and cross sections. Converted by the Reading from 2-8-8-2 Type.

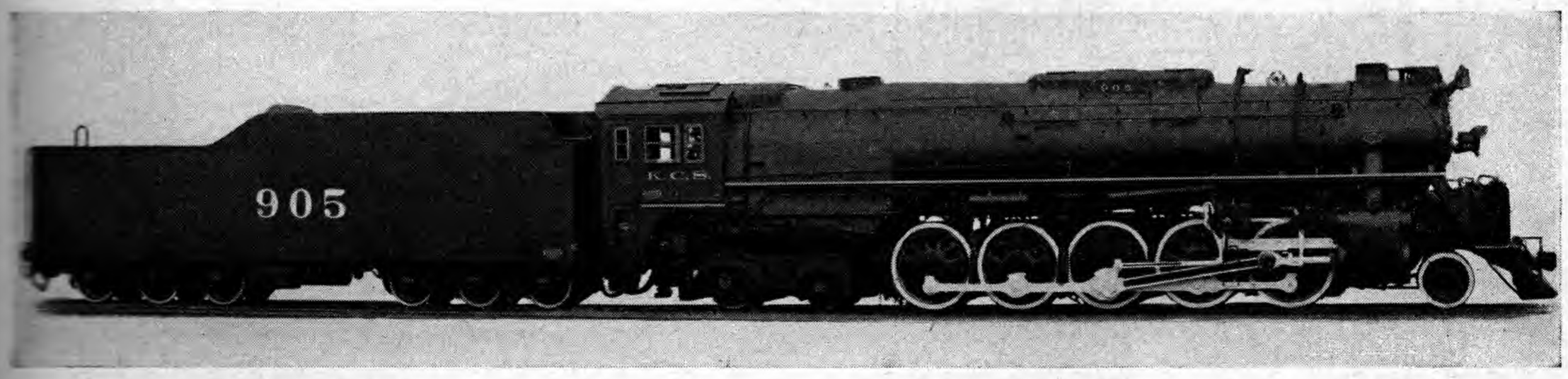


Atchison, Topeka & Santa Fe 2-10-4 Type Locomotive, Class 5011, for freight service. Road Nos. 5011-5035. Equipped with Limited Cutoff. Built by The Baldwin Locomotive Works.

Tractive force, engine (72.5 per cent)	93,000 lb.	Total engine wheel base	50 ft. 2 in.
Cylinders, diameter and stroke	30 in. x 34 in.	Boiler diameter, front	94 in.
Drivers, diameter	74 in.	Fuel	oil
Weight on drivers	380,000 lb.	Firebox, length and width	162 in. x 108 in.
Weight on front truck	50,000 lb.	Grate area	121.5 sq. ft.
Weight on trailing truck	108,000 lb.	Steam pressure	310 lb.
Total weight of engine	538,000 lb.	Evaporative heating surface	494 + 5,443 = 5,937 sq. ft.
Weight of tender (⅔ loaded)	369.690 lb.	Superheating surface (Type E)	2,589 ft.
Driving wheel base	26 ft. 2 in.	Tender capacity	24,500 gal. water; 7,000 gal. oil

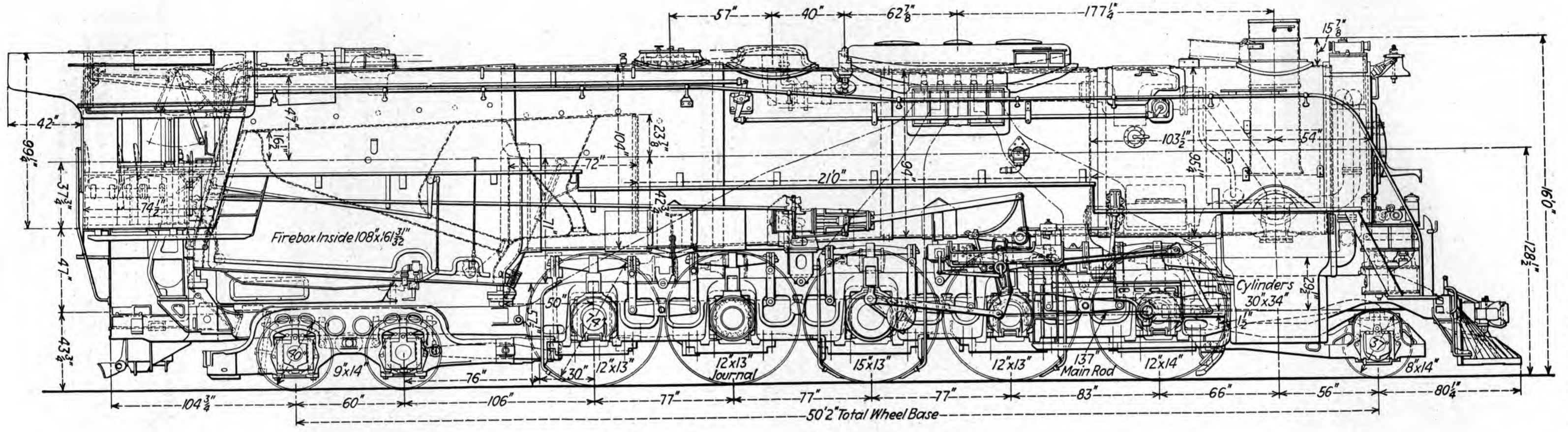
Canadian Pacific 2-10-4 Type Locomotive, Class T-1c, for freight service; Road Nos. 5930-5935. Equipped with Booster. Built by the Montreal Locomotive Works, Ltd.

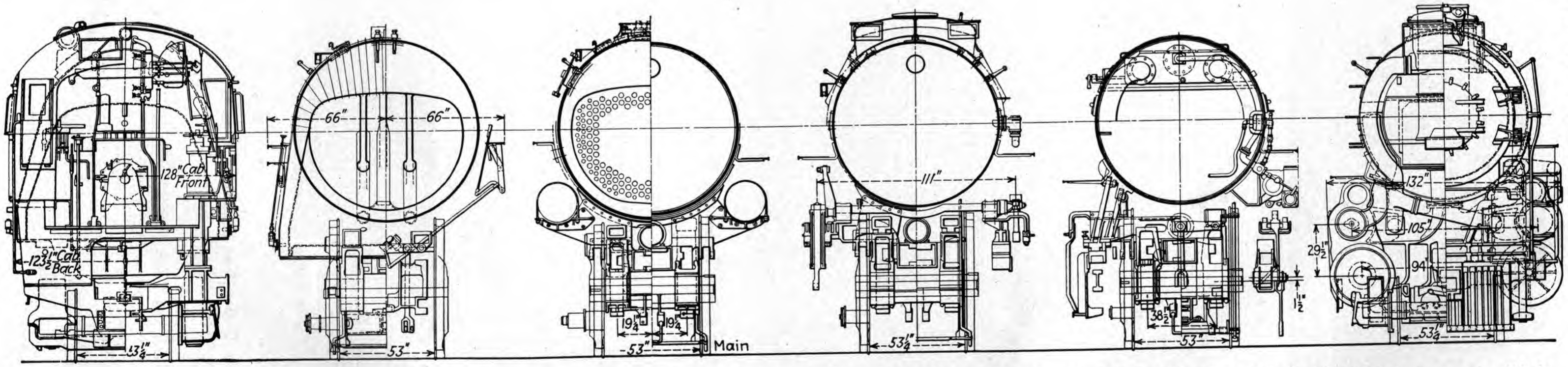
Tractive force, engine	76,900 lb.	Driving wheel base	22 ft. 0 in.
Tractive force, booster	12,500 lb.	Total engine wheel base	46 ft. 0½ in.
Cylinders, diameter and stroke	25 in. x 32 in.	Fuel	Oil
Drivers, diameter	63 in.	Firebox, length and width	140 3/16 in. x 96 in.
Weight on drivers	311,200 lb.	Grate area	93.5 sq. ft.
Weight on front truck	35,500 lb.	Steam pressure	285 lb.
Weight on trailing truck	102,300 lb.	Evaporative heating surface	412 + 4,642 = 5,054 sq. ft.
Total weight of engine	449,000 lb.	Superheating surface (Type E)	2,032 sq. ft.
Weight of tender	283,500 lb.	Tender capacity	12,000 Imp. gal. water, 4,500 Imp. gal. oil



Kansas City Southern 2-10-4 Type Locomotive, Class J, Road Nos. 900-909, for freight service. Built by the Lima Locomotive Works, Inc.

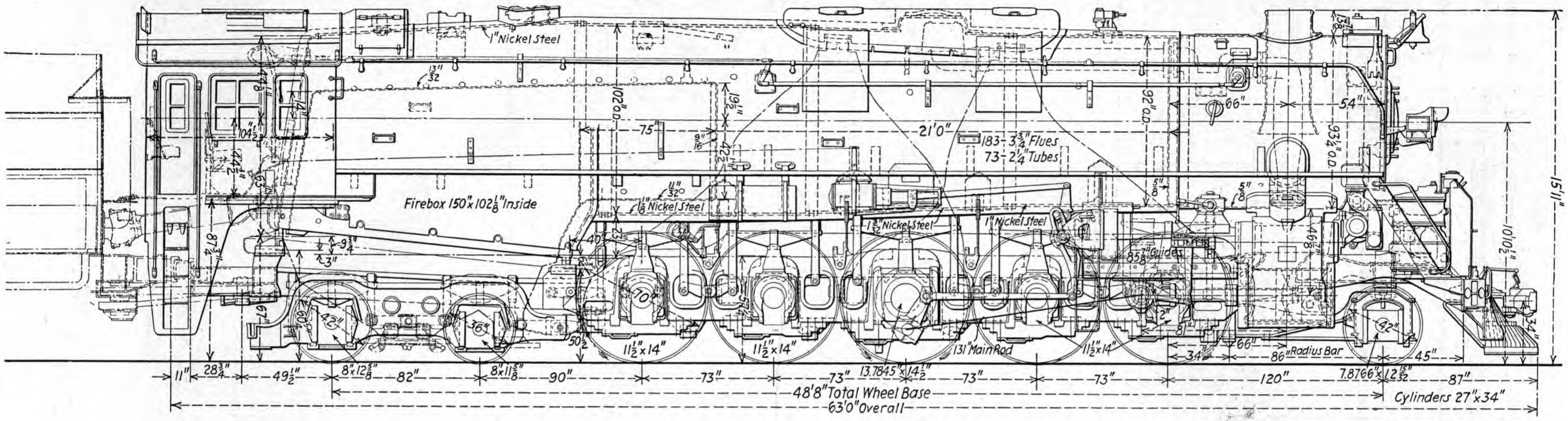
Tractive force, engine	93,300 lb.	Driving wheel base	24 ft. 4 in.
Cylinders, diameter and stroke	27 in. x 34 in.	Total engine wheel base	48 ft. 8 in.
Drivers, diameter	70 in.	Fuel	Soft coal or oil
Weight on drivers	353,300 lb.	Grate area	107 sq. ft.
Weight on front truck	51,500 lb.	Steam pressure	310 lb.
Weight on trailing truck	109,200 lb.	Evaporative heating surface	500 + 4,654 = 5,154 sq. ft.
Total weight of engine	359,690 lb.	Superheating surface (Type E)	2,075 sq. ft.
Weight of tender, loaded (coal)	359,690 lb.	Tender capacity	20,700 gal., 25 tons
Weight of tender, loaded (oil)	348,000 lb.	Tender capacity	21,700 gal. water, 4,500 gal. oil

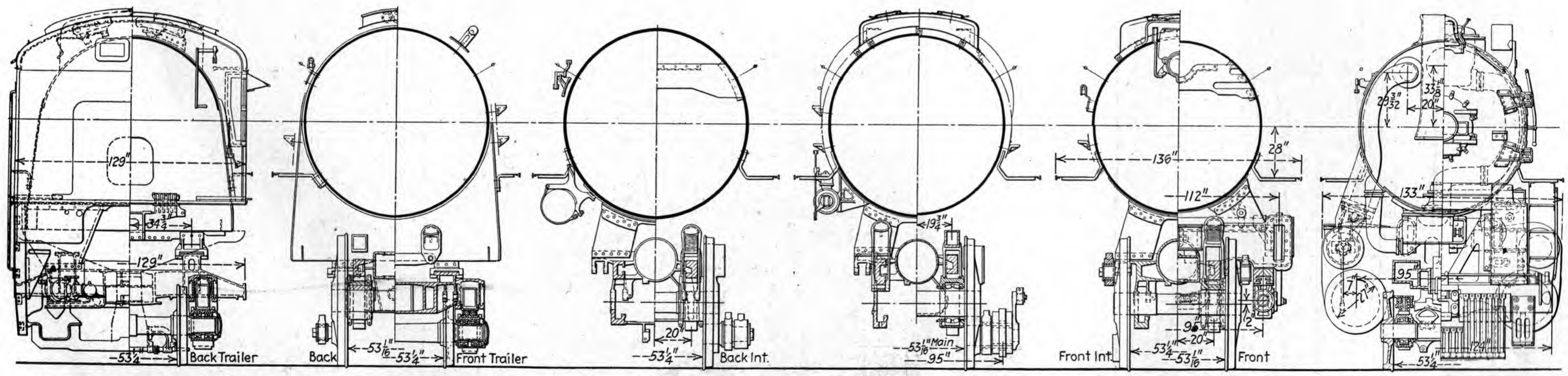




Atchison, Topeka & Santa Fe, 2-10-4 Type Locomotive for freight service. Elevations and cross sections. Road Nos. 5001-5005 coal-burning; 5006-5010 oil-burning. Built by The Baldwin Locomotive Works.

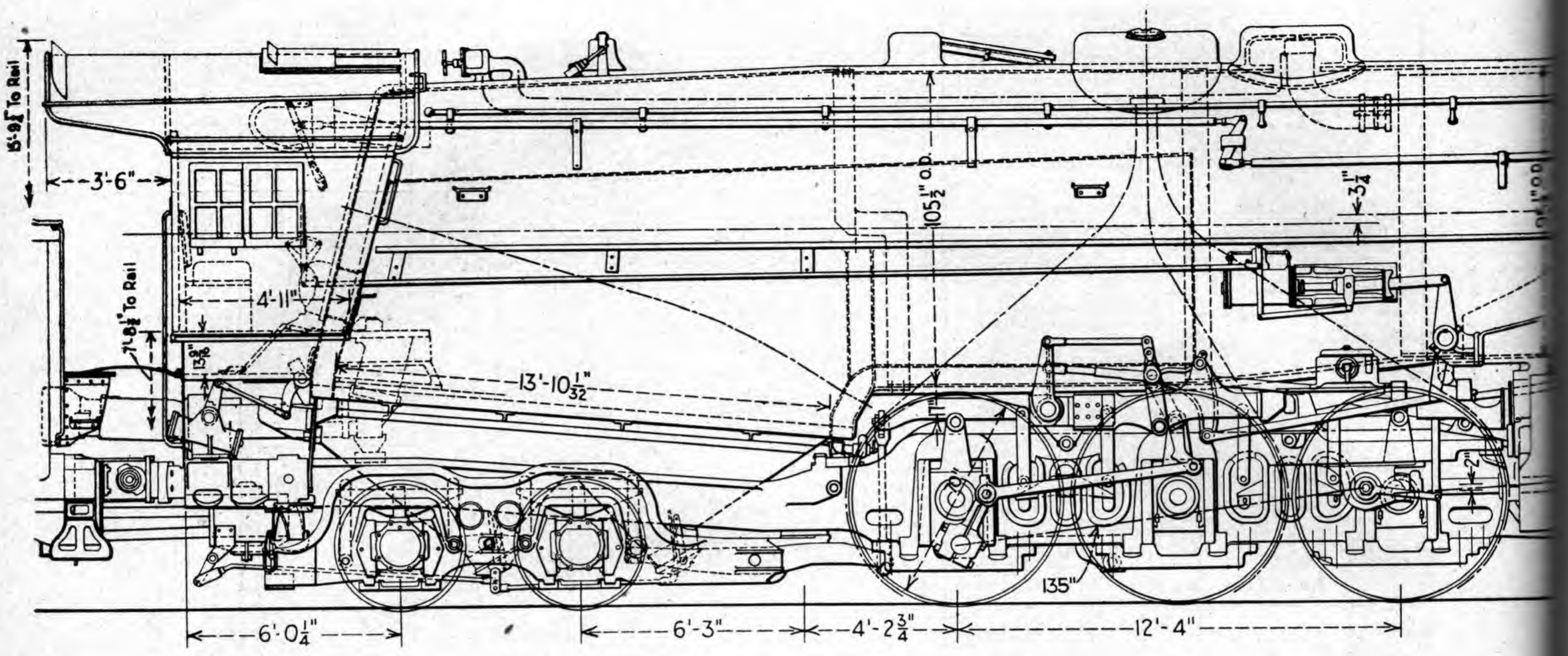
Description: *Railway Mechanical Engineer,* February 1939; *Railway Age,* December 3, 1938

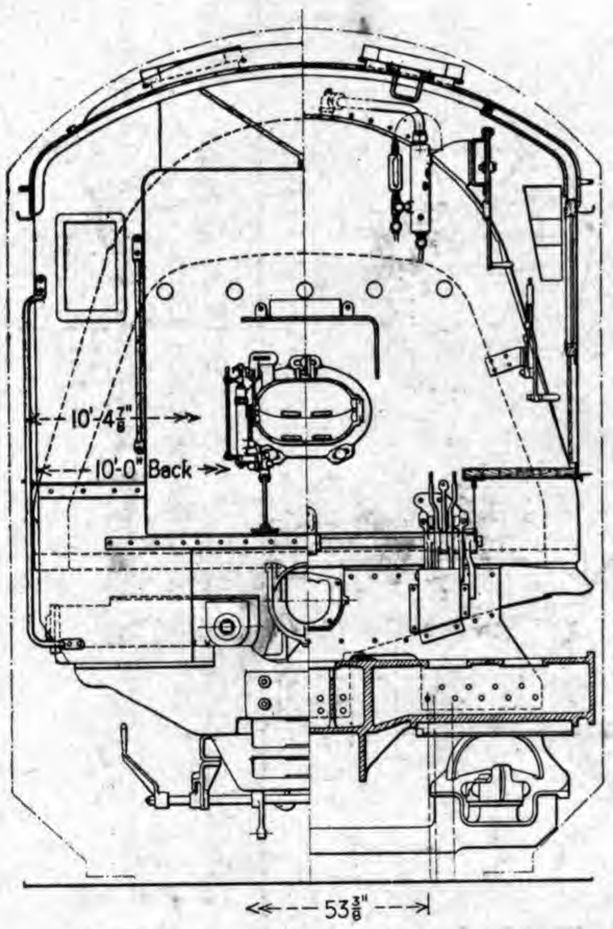


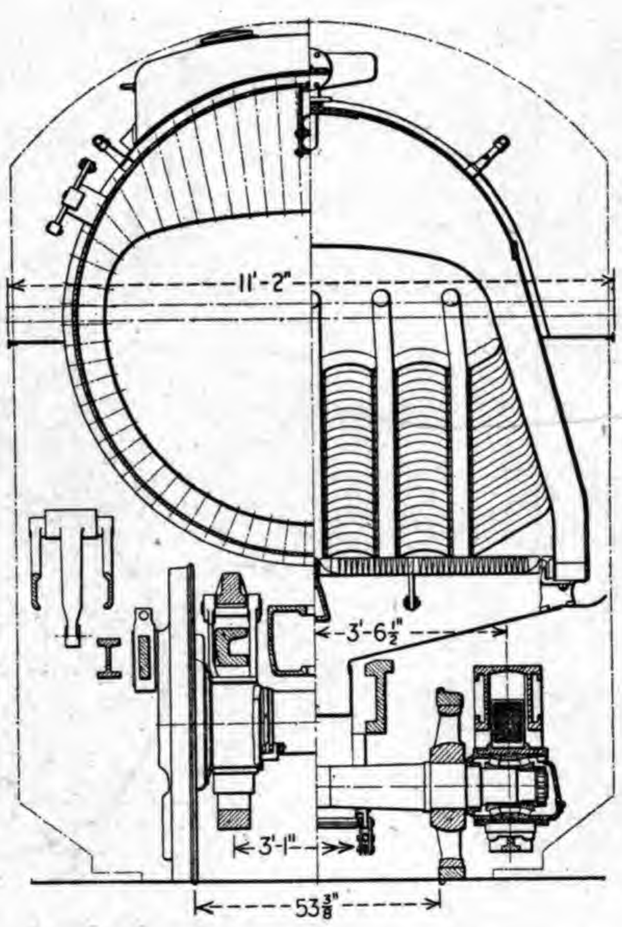


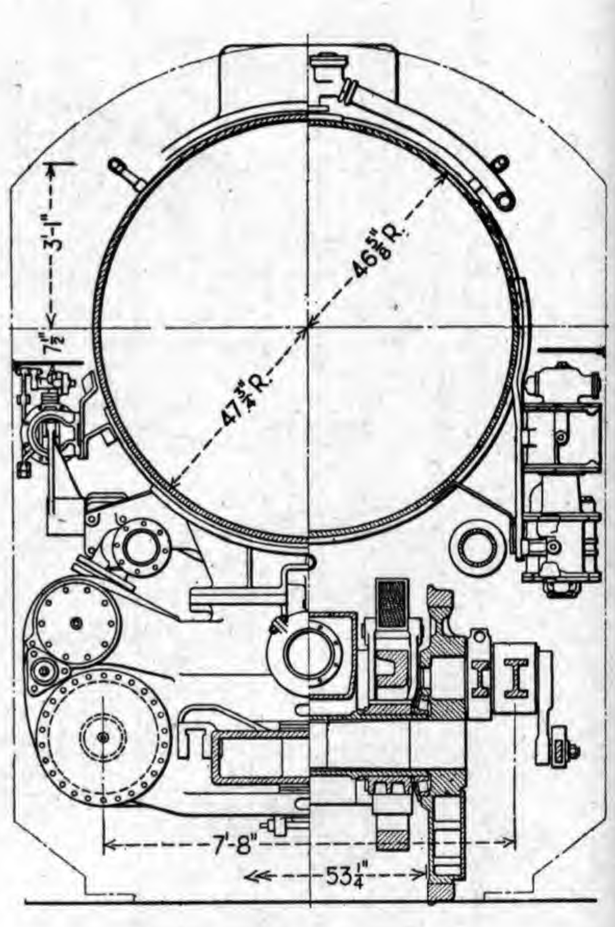
Kansas City Southern 2-10-4 Type Locomotive, Class J. Road Nos. 900-904 (Oil-Burning) and 905-909 (Coal-Burning). Elevation and cross sections. Built by Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

Description: *Railway Mechanical Engineer*, December, 1937; *Railway Age*, January 8, 1938

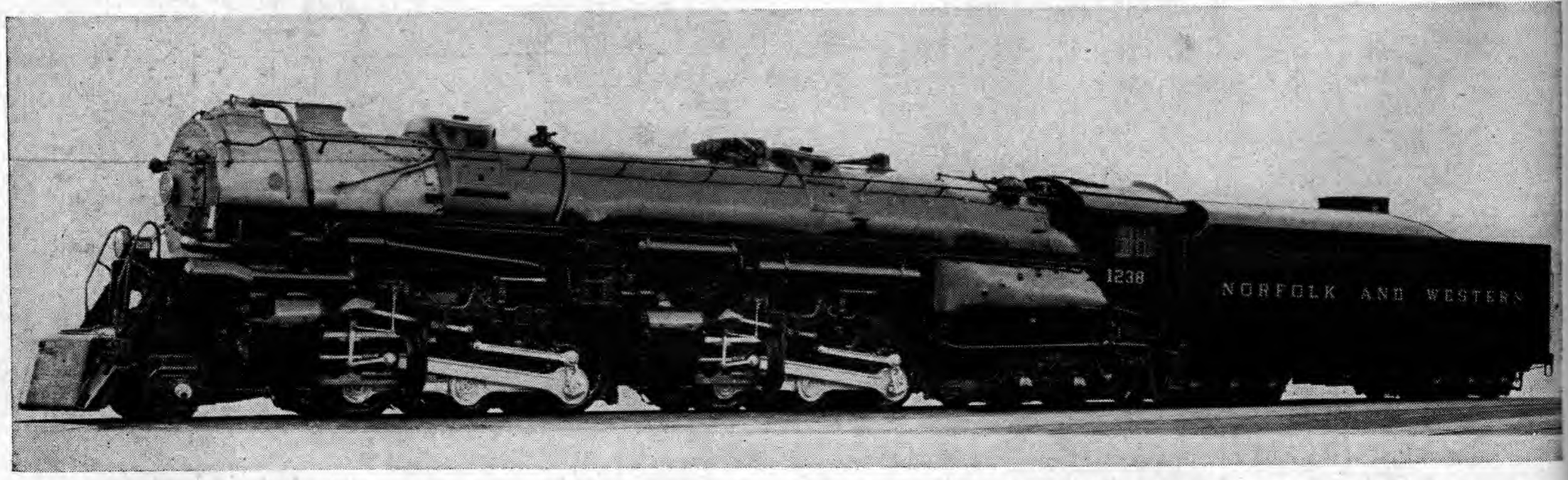




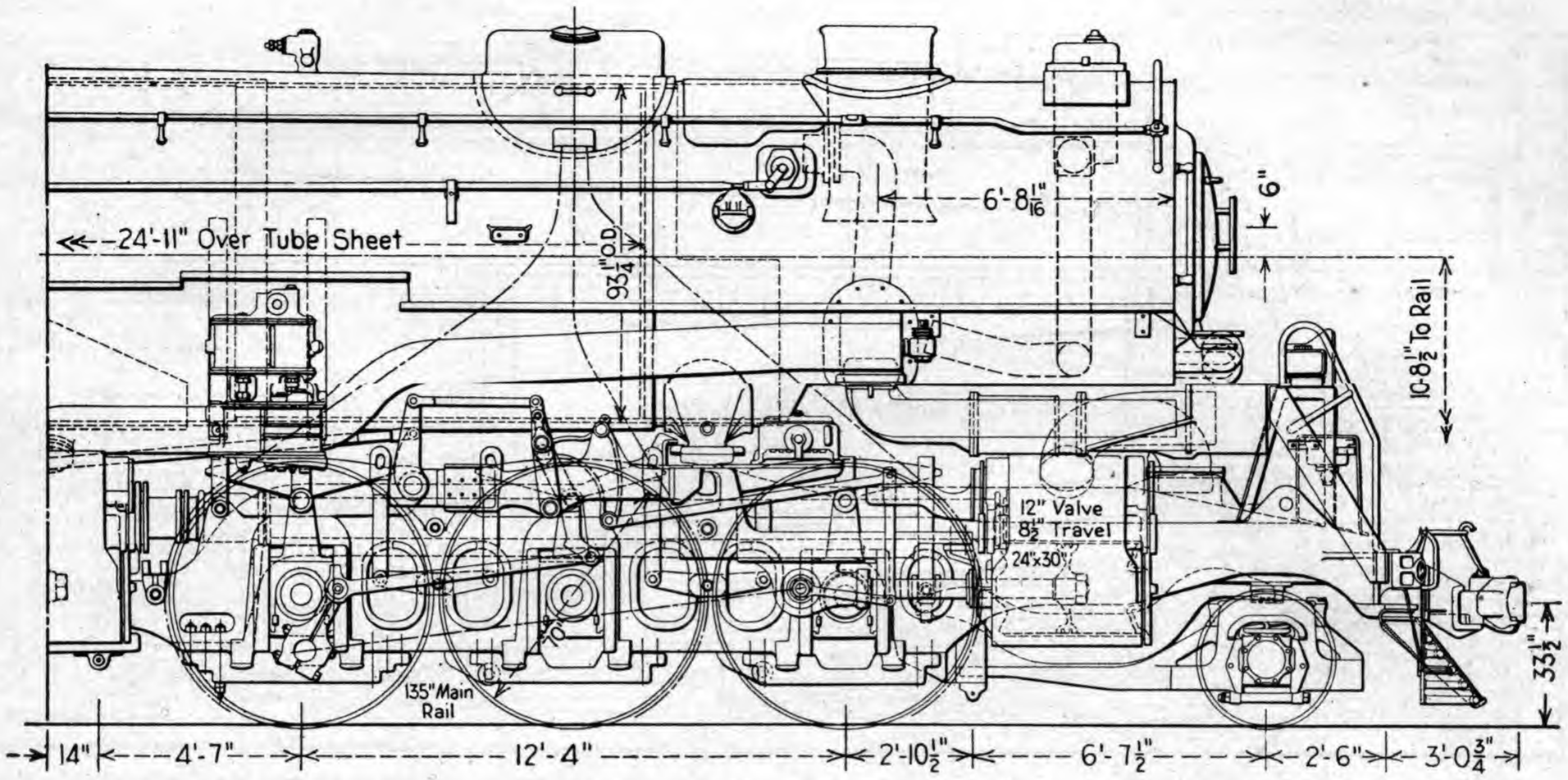




Note: Beginning with Locomotive No. 1238 roller bearing crank pins and lightweight reciprocating parts with roller bearing crosshead pins were applied.

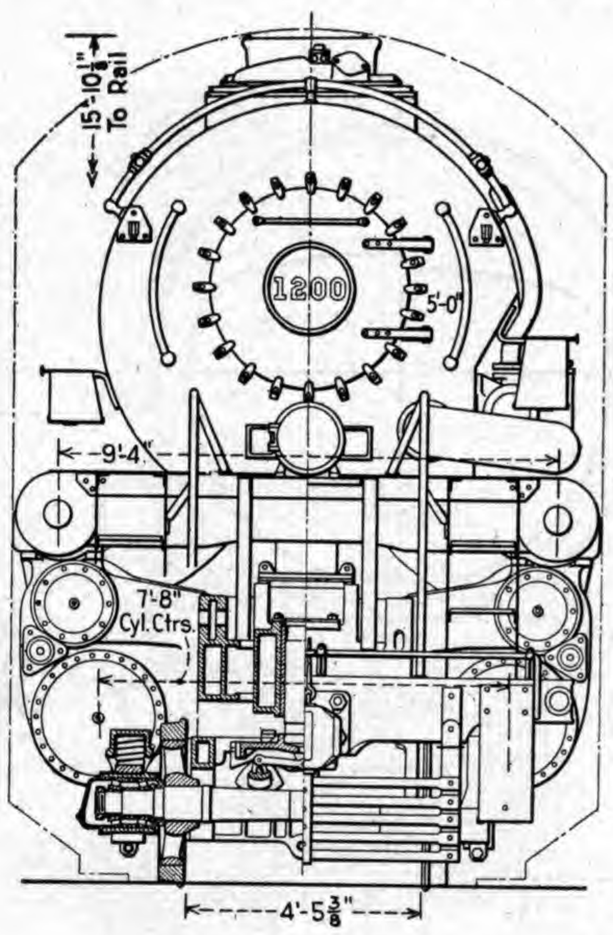


Norfolk & Western 2-6-6-4 Single-Expansion Articulated Locomotive. Class A, Road Nos. 1200-1222 and 1238-1242, for fast freight service. Built by N. & W. Shops, Roanoke, Va.



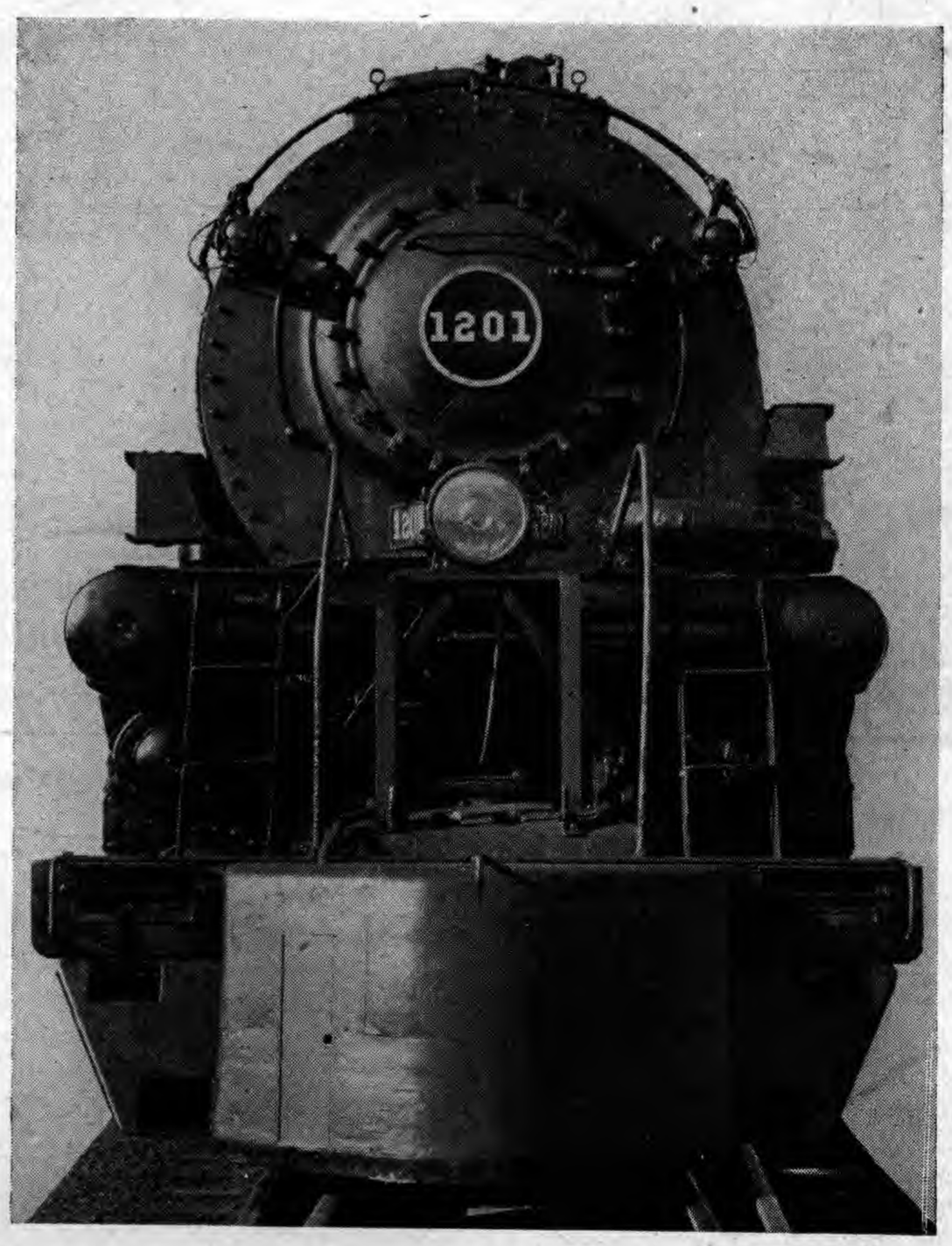
Erecting elevation and sections of Norfolk & Western 2-6-6-4 Single-Expansion Articulated Locomotive.

Note: These drawings cover original lot, Road Nos. 1200-1209. A few slight changes were made in later locomotives such as application of cast steel pilot; replacing Standard Type MB stoker with Type HT and installation of five circulators in firebox instead of arch tubes.



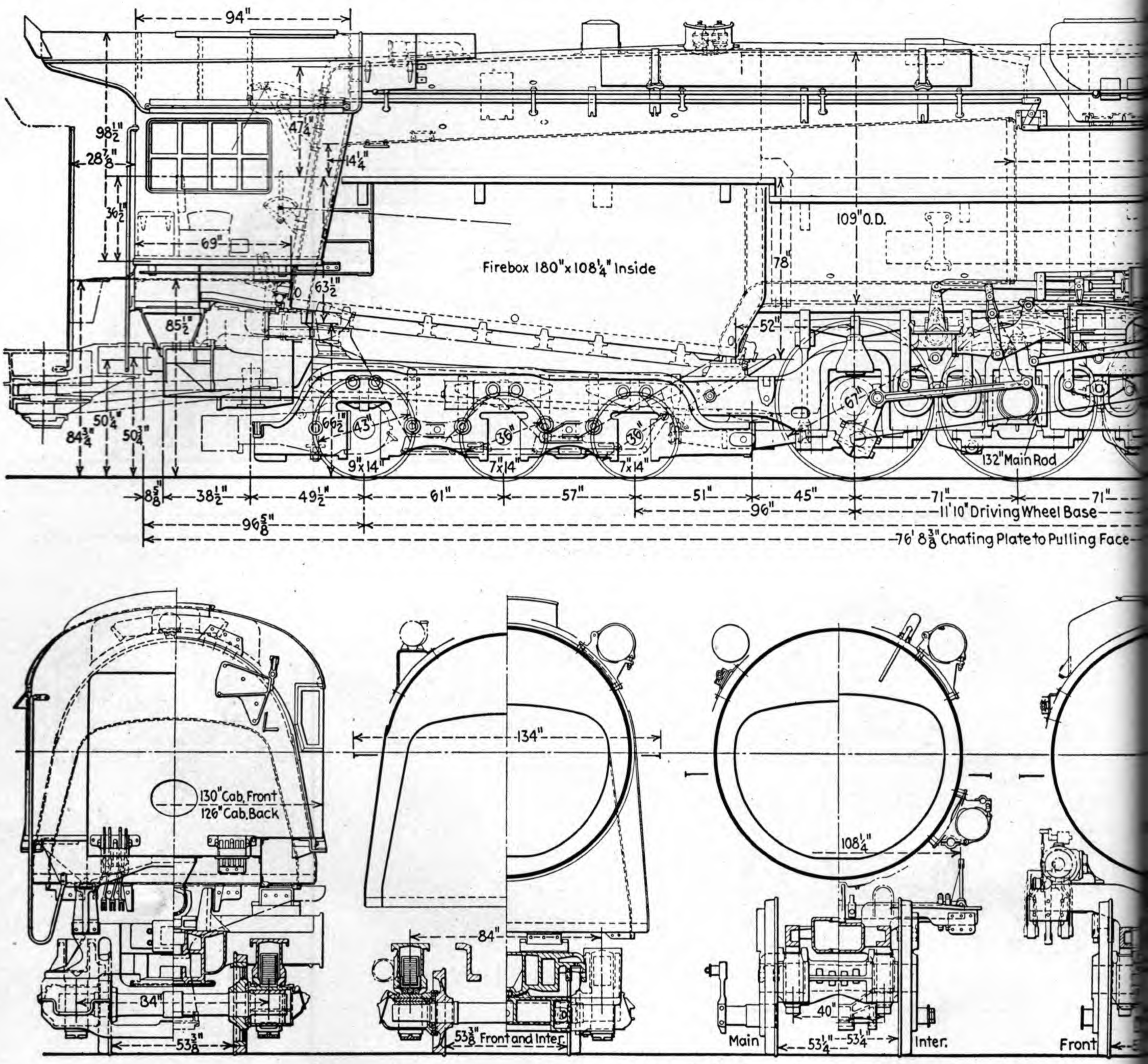
Weights and Dimensions—Road Nos. 1238-1242

Tractive force	114,000 lb.
Cylinders, diameter and stroke (4)	24 in. by 30 in.
Drivers, diameter	70 in.
Weight on drivers	432,350 lb.
Weight on front truck	30,480 lb.
Weight on trailing truck	110,170 lb.
Total weight of engine	573,000 lb.
Weight of tender, loaded	378,600 lb.
Driving wheel base, each	12 ft. 4 in.
Total engine wheel base	60 ft. 4¾ in.
Fuel	Soft coal
Grate area	122 sq. ft.
Steam pressure	300 lb.
Heating surface, firebox and combustion chamber	530 sq. ft.
Heating surface, arch tubes	57 sq. ft.
Heating surface, firebox total	587 sq. ft.
Heating surface, tubes and flues	6052 sq. ft.
Evaporative heating surface, total	6,639 sq. ft.
Superheating surface (Type E)	2,703 sq. ft.
Tender capacity	22,000 gal. water; 30 tons coal



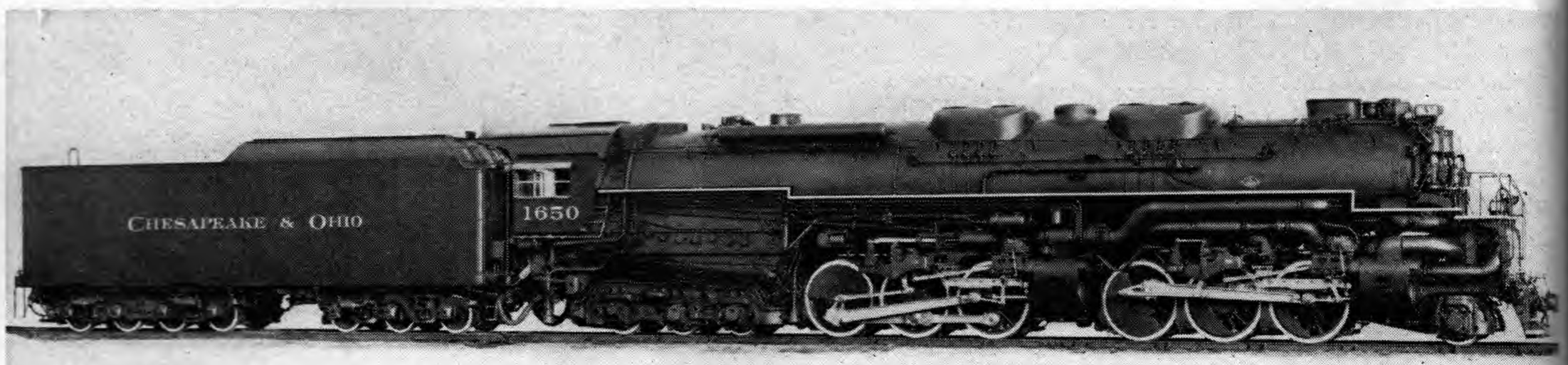
Front end view of Norfolk & Western 2-6-6-4 Single-Expansion Articulated Locomotive for fast freight service. Built by N. & W. Railroad Shops, Roanoke, Va.

(Description of earlier locomotives: *Railway Mechanical Engineer,* October, 1936; *Railway Age,* January 2, 1937)

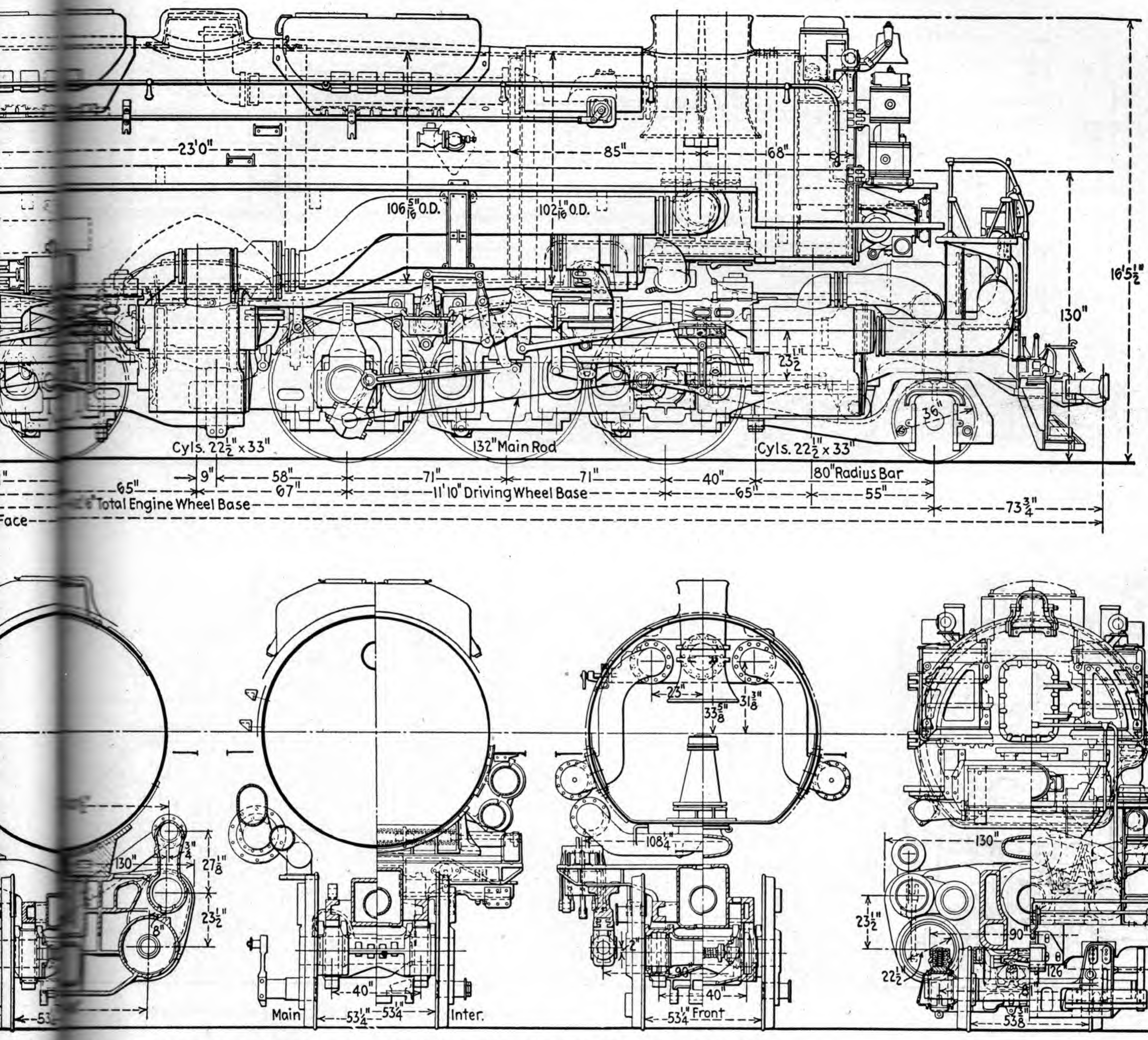


Elevation and Cross Sections of Chesapeake & Ohio 2-6-6-6 Type Single-Expa

Tractive force	110,200 lb.	Driving wheel base, each	11 ft. 10 in.
Cylinders, diameter and stroke (4)	22½ in. x 33 in.	Total engine wheel base	62 ft. 6 in.
Drivers, diameter	67 in.	Fuel	Soft coal
Weight on drivers	504,000 lb.	Grate area	135.3 sq. ft.
Weight on front truck	65,570 lb.	Steam pressure	260 lb.
Weight on trailing truck	182,250 lb.	Evaporative heating surface	762 + 6,032 = 6,794 sq. ft.
Total weight of engine	751,830 lb.	Superheating surface (Type E)	2,922 sq. ft.
Weight of tender, ⅔ loaded	346,710 lb.	Tender capacity	26,500 gal., 25 tons



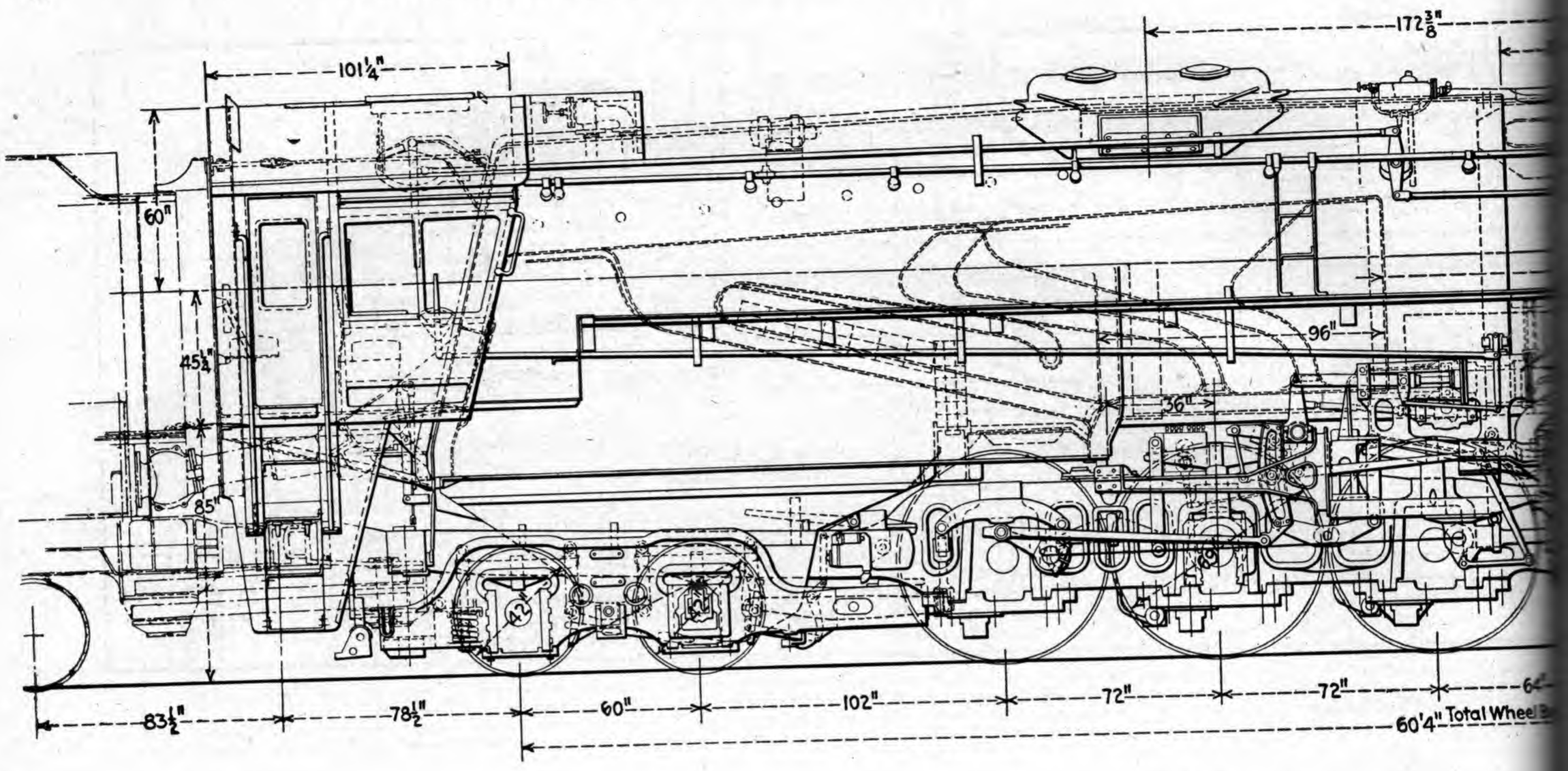
Chesapeake & Ohio 2-6-6-6 Type Single-Expansion Articulated Locomotive. Class H-8, Road Nos. 1645-1659. Built by the Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

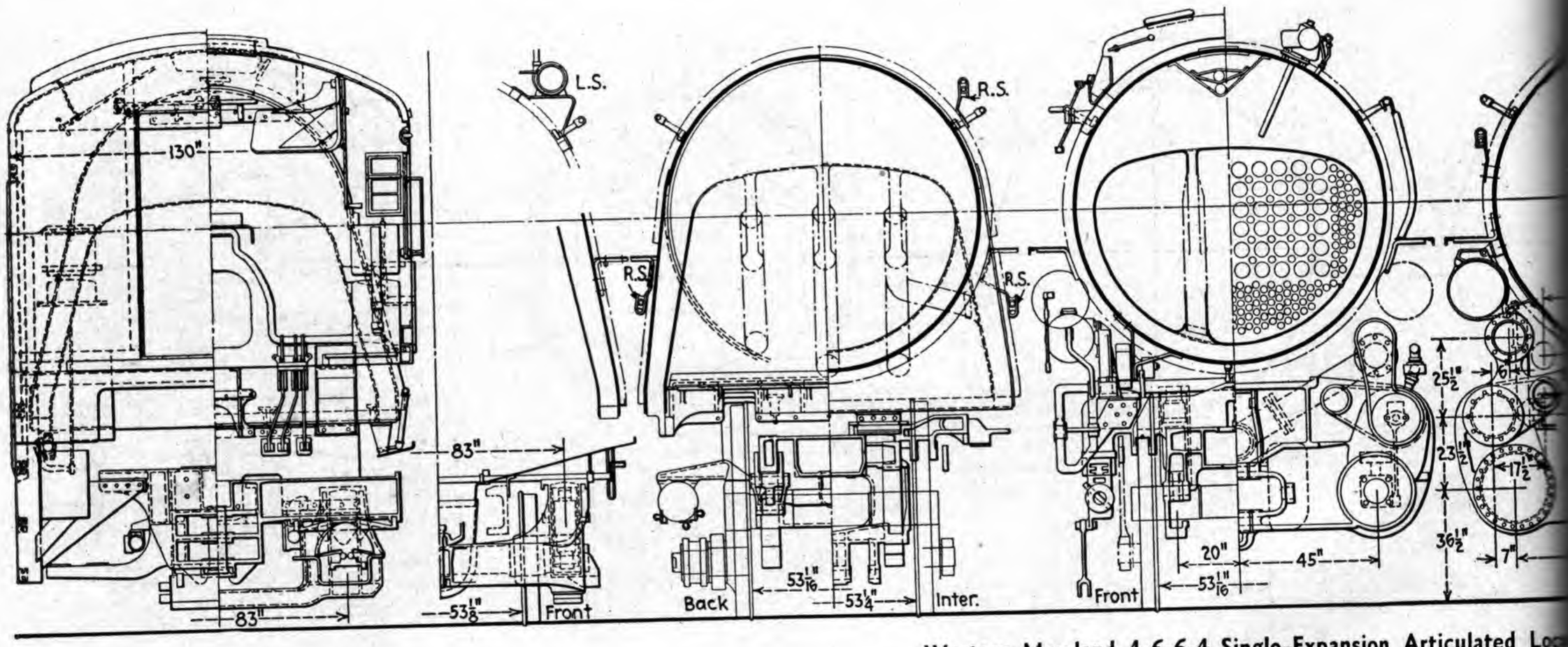


-Expans[illegible]culated Locomotive built by Lima Locomotive Works, Inc. Class H-8, Road Nos. 1600-1659.

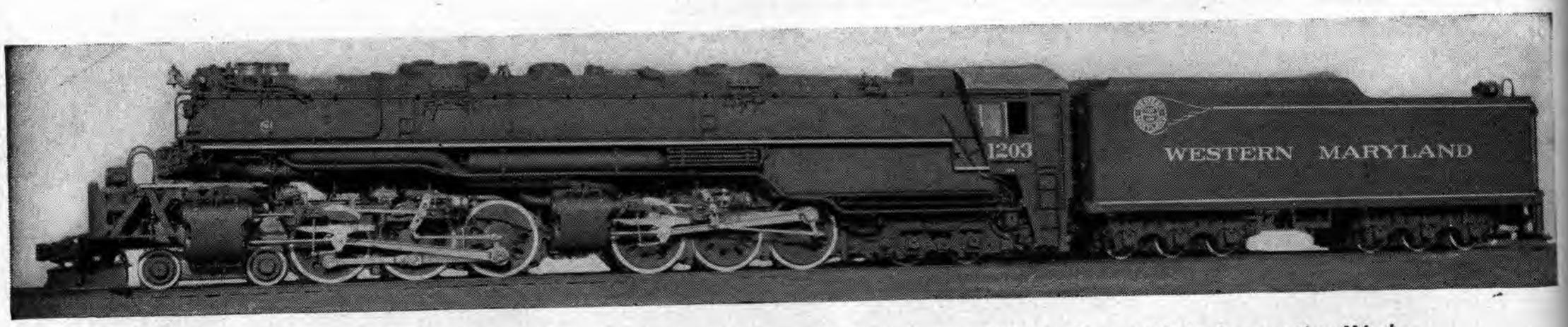
Support of boiler at throat sheet on bed of rear unit.

Cylinders of rear unit and waist sheet bearer.



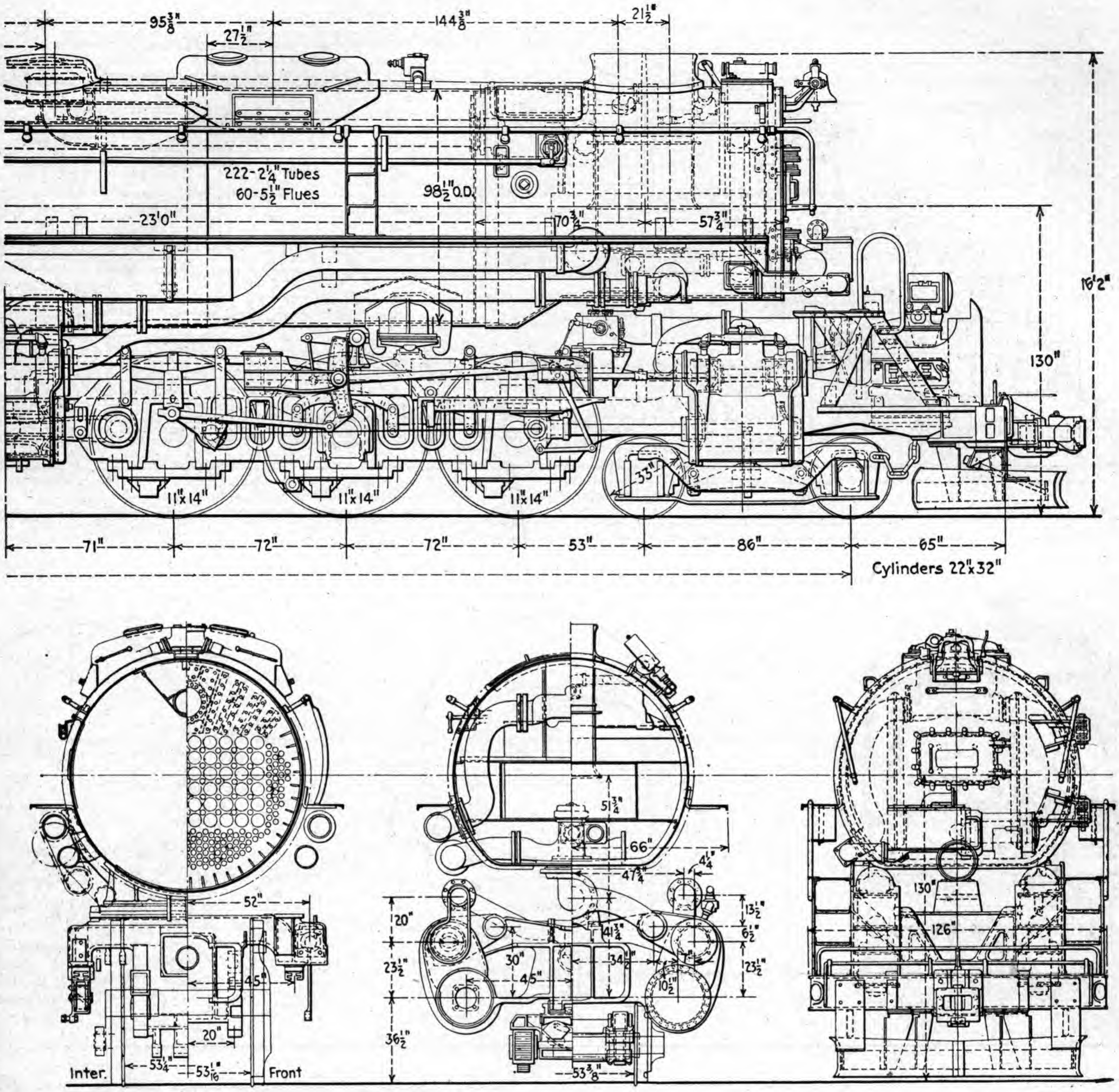


Western Maryland 4-6-6-4 Single-Expansion Articulated Loc

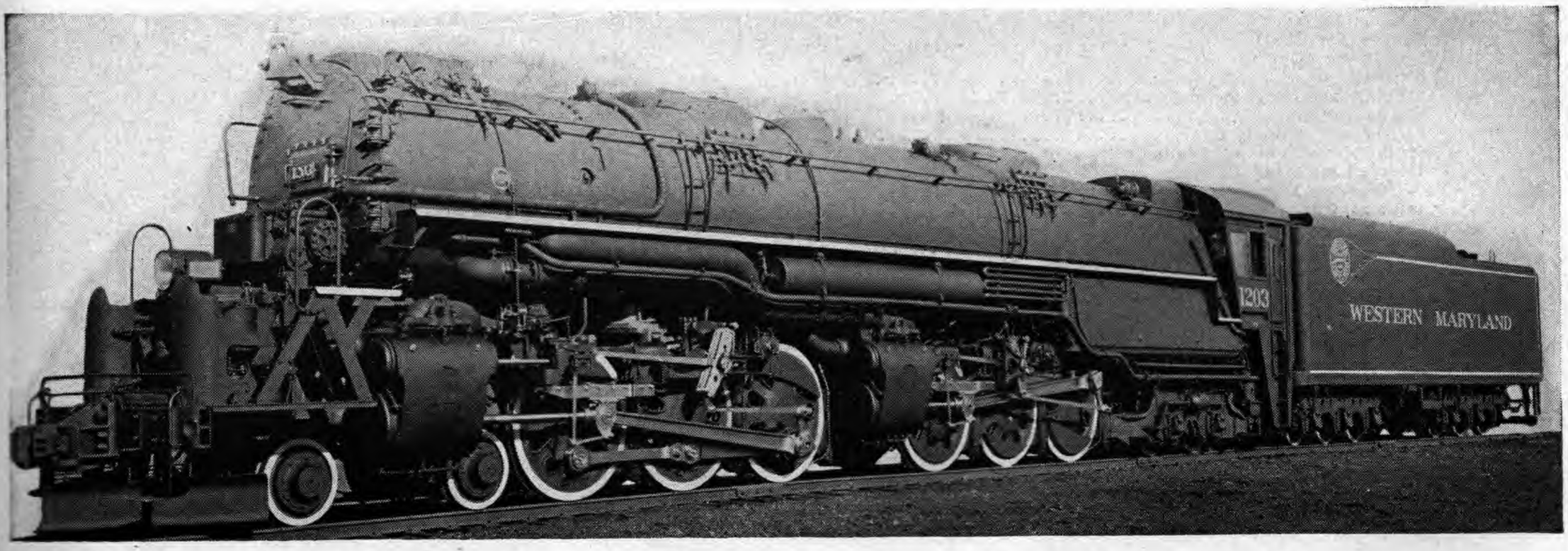


Western Maryland 4-6-6-4 Type Single-Expansion Articulated Locomotive. Built by The Baldwin Locomotive Works.

Tractive force, engine	95,500 lb.
Cylinders, diameter and stroke (4)	22 in. x 32 in.
Drivers, diameter	69 in.
Weight on drivers	402,266 lb.
Weight on front truck	81,500 lb.
Weight on trailing truck	117,234 lb.
Total weight of engine	601,000 lb.
Weight of tender (⅔ loaded)	338,250 lb.
Driving wheel base, each	12 ft. 0 in.
Total engine wheel base	60 ft. 4 in.
Fuel	Soft coal
Grate area	118.8 sq. ft.
Steam pressure	250 lb.
Evaporative heating surface	796 + 4,974 = 5,770 sq. ft.
Superheating surface (Type A)	1,735 sq. ft.
Tender capacity	22,000 gal., 30 tons

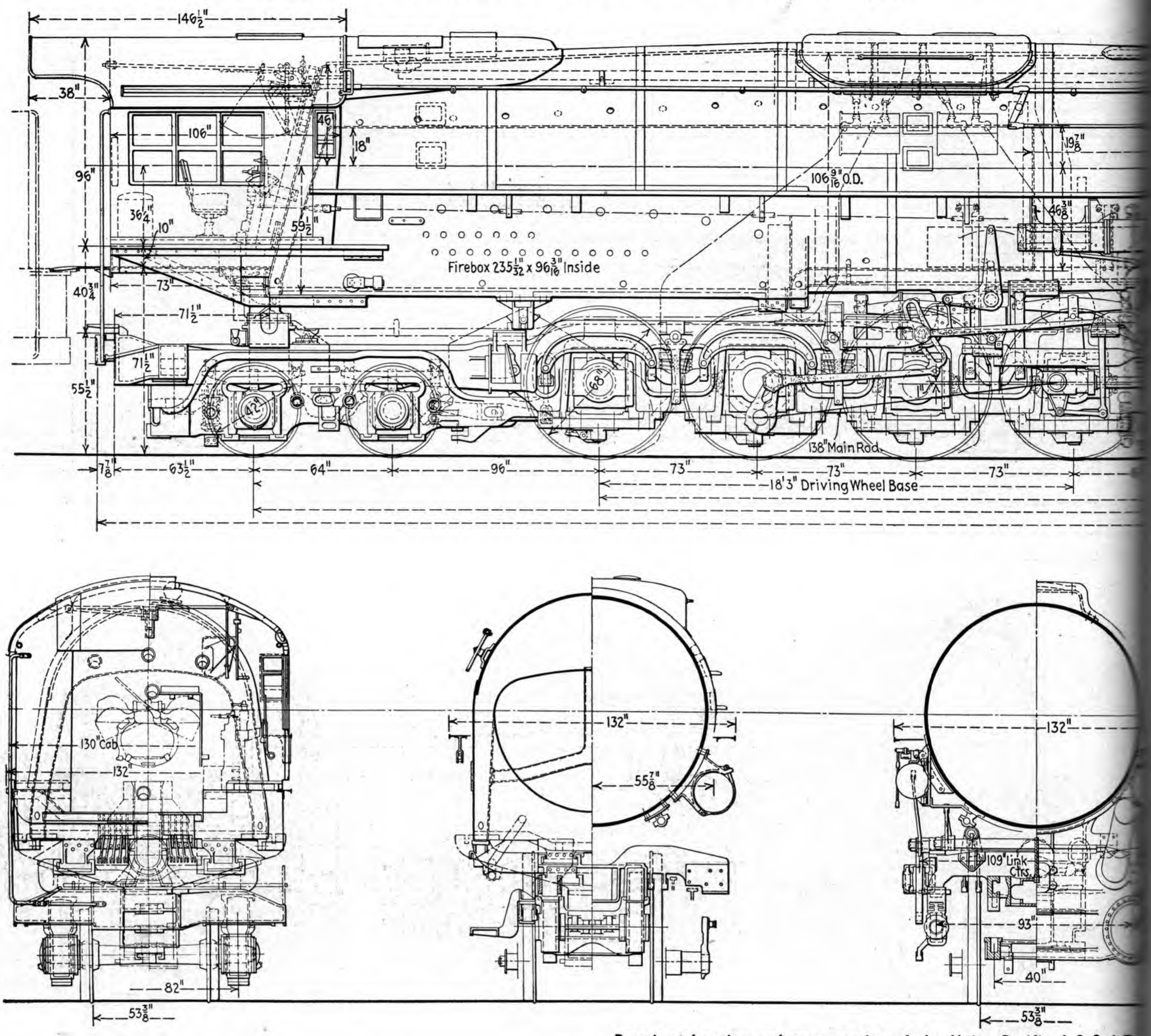


Class M-2, Road Nos. 1201-1212. Erecting, elevation and cross sections.



Western Maryland Articulated Locomotives replaced 2-10-2 type for freight service on heavy grades.

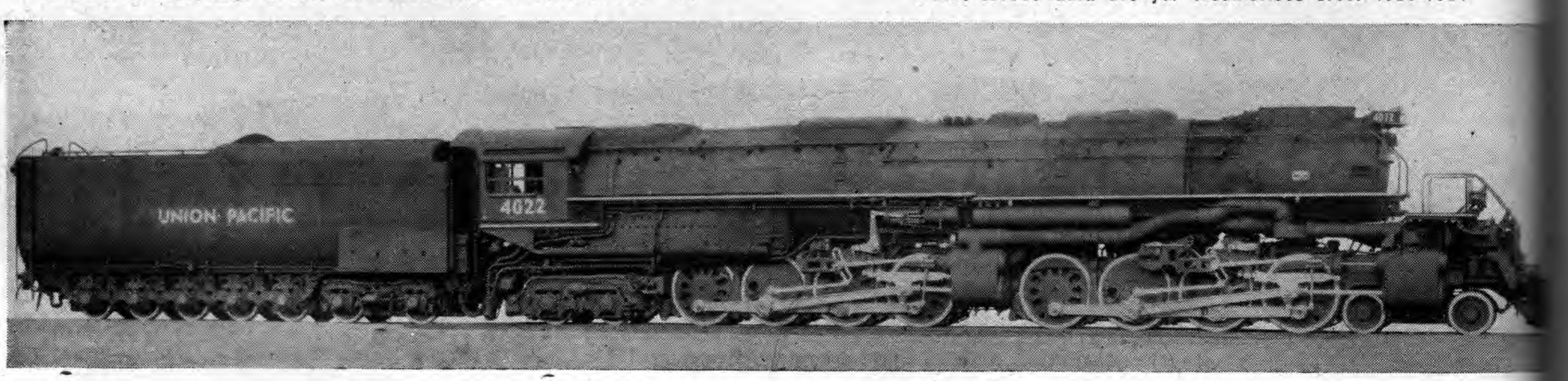
Descriptions: *Railway Mechanical Engineer,* February 1941; *Railway Age,* January 25, 1941



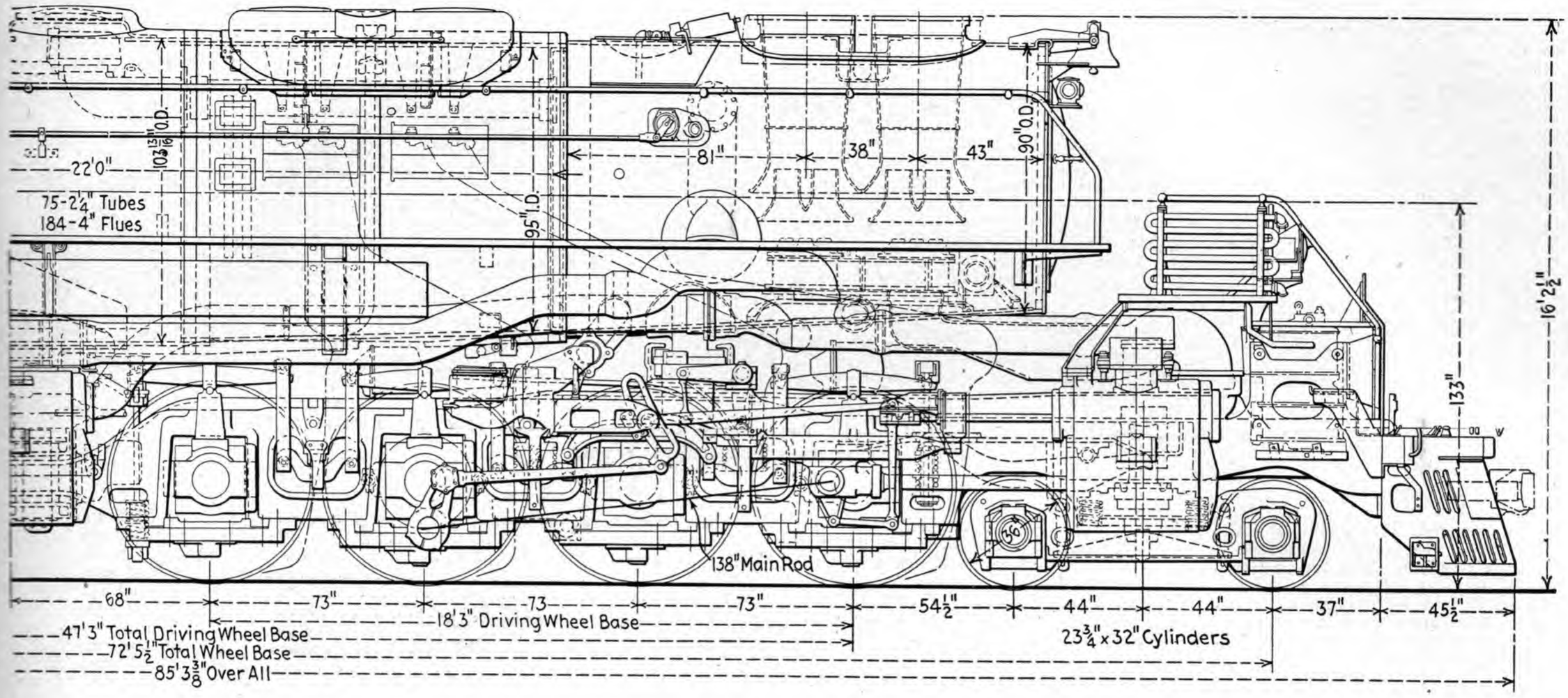
Erecting elevation and cross-section of the Union Pacific 4-8-8-4 T

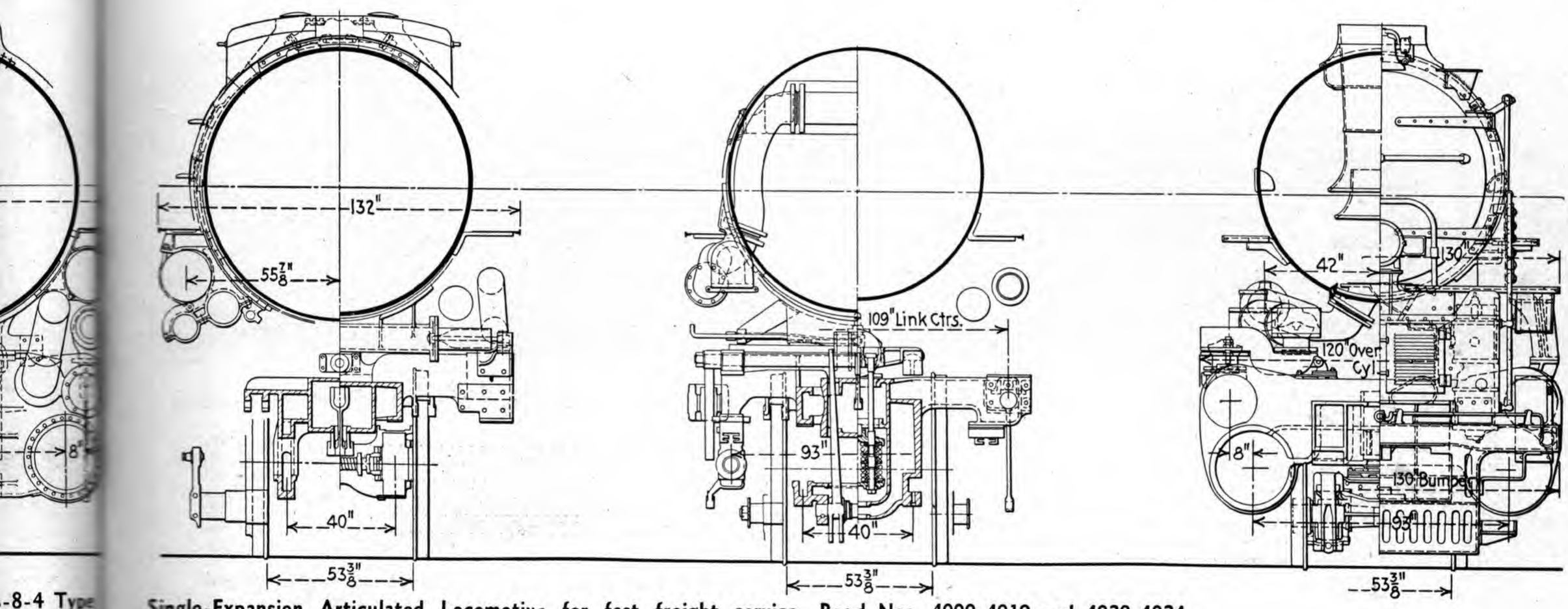
Rated tractive force, engine, lb.	135,375
Weights in working order, lb.:	
On drivers	545,000
On front truck	99,800
On trailing truck	127,200
Total engine	772,000
Tender (⅔ load)	**348,000**
Wheel bases, ft.-in.:	
Driving, total	47-3
Front and rear engine, each	18-3
Engine, total	72-5½
Engine and tender, total	117-7
Driving wheels, diameter outside tires, in.	68
Cylinders, number, diameter and stroke, in.	4-23¾x32
Valves, piston type, size, in.	12
Maximum travel, in.	7
Boiler:	
Steam pressure, lb.	300
Diameter, first ring, inside, in.	95
Firebox length, in.	235 1/32
Firebox width, in.	96 3/16
Combustion chamber length, in.	112
Security circulators, number	7
Tubes, number and diameter, in.	212-2¼
Flues, number and diameter, in.	73-5½
Length over tube sheets, ft.-in.	22-0
Fuel	Soft coal
Grate area, sq. ft.:	150.3
Heating surfaces, sq. ft.:	
Firebox and comb. chamber	593
Security circulators	111
Firebox, total	720
Tubes and flues	5,035
Evaporative, total	5,755
Superheater (Type A)	2,043
Comb. evap. and superheater	7,798
Tender capacity	25,000 gal. water, 28 tons co

Note: Above data are for locomotives Nos. 4020-4024

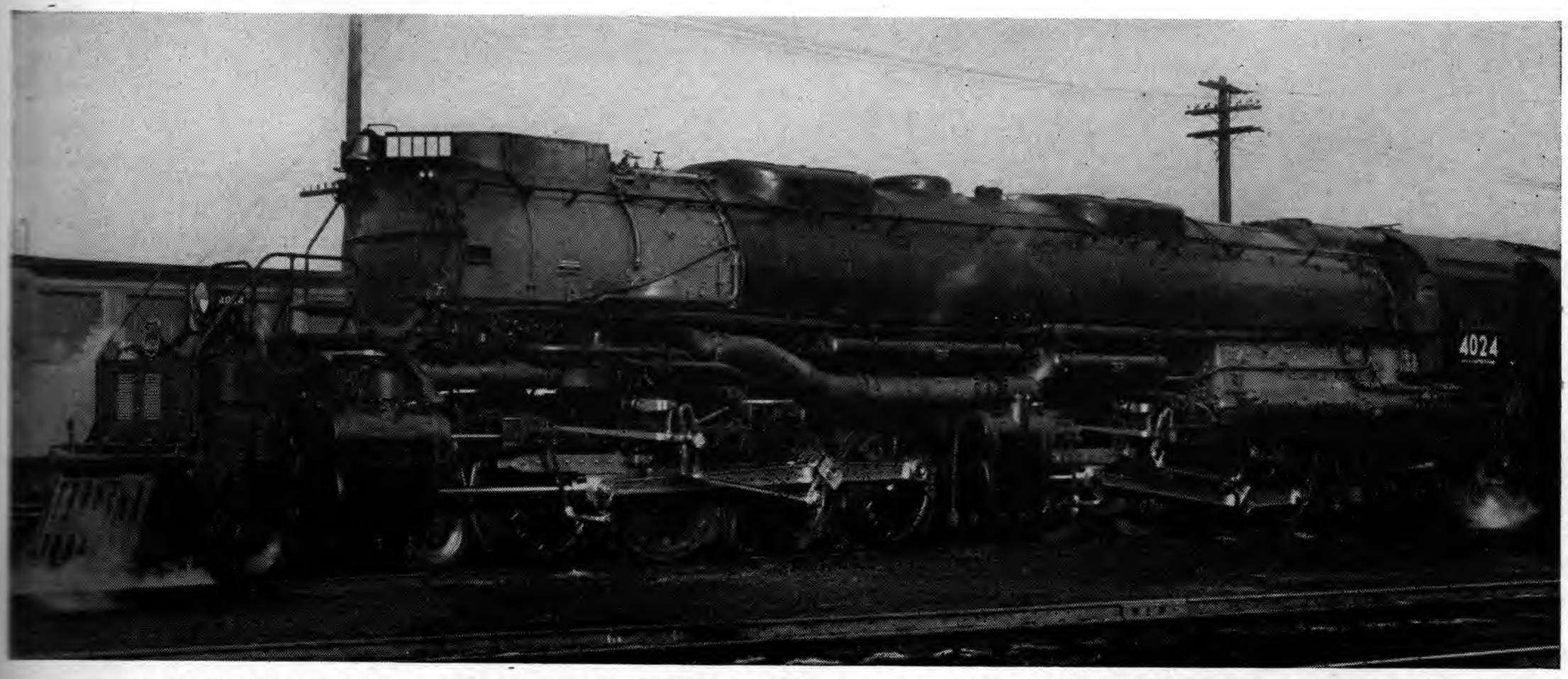


Union Pacific 4-8-8-4 Type Locomotive built by American Locomotive Company.
Descriptions: *Railway Age,* October 4, 1941; *Railway Mechanical Engineer,* November, 1941

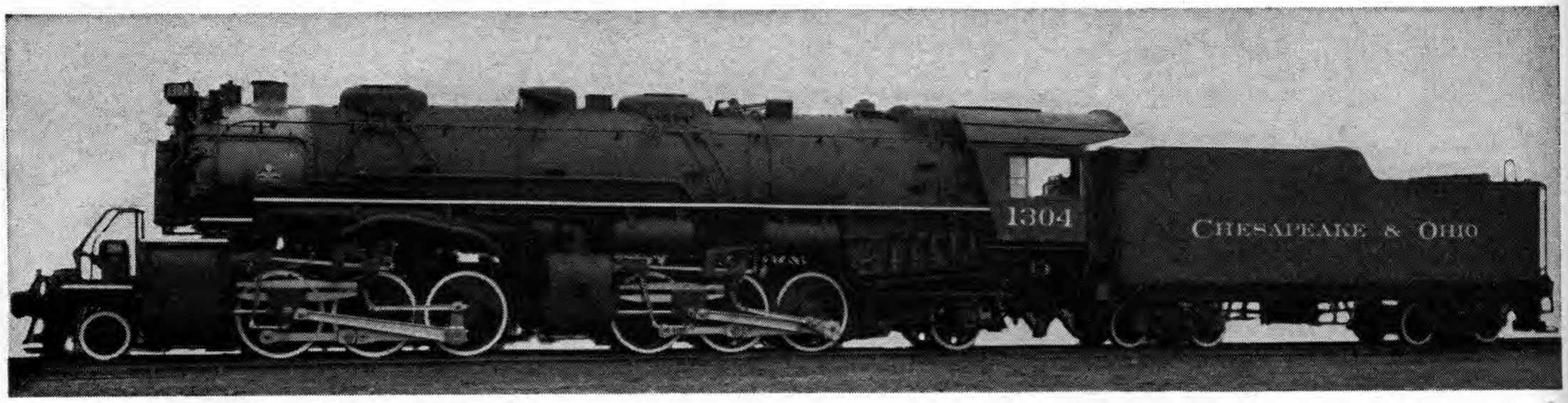




Single-Expansion Articulated Locomotive for fast freight service, Road Nos. 4000-4019 and 4020-4024.



Union Pacific 4-8-8-4 Type Locomotive (Second lot, Road Nos. 4020-4024), built by the American Locomotive Company.

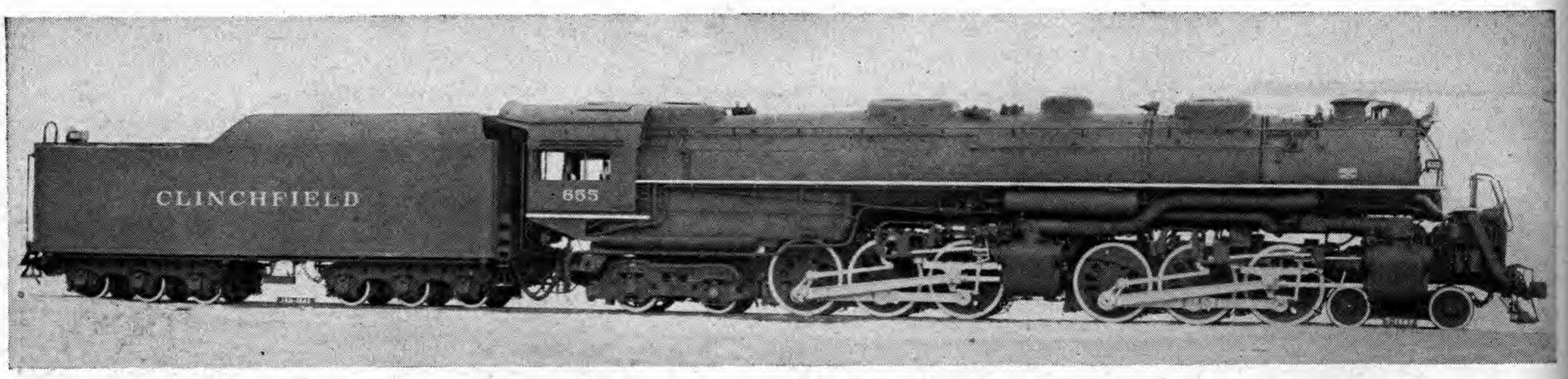


Chesapeake & Ohio 2-6-6-2 Type Compound Mallet Articulated Locomotive. Class H-6. Road Nos. 1300-1309. Built by The Baldwin Locomotive Works.

Tractive force, simple	98,700 lb.	Driving wheel base, each	10 ft. 0 in.
Tractive force, compound	78,250 lb.	Total engine wheel base	48 ft. 10 in.
Cylinders, diameter and stroke	22 in. & 35 in. x 32 in.	Boiler diameter, maximum	95¾ in. I. D.
Drivers, diameter	56 in.	Fuel	Soft coal
Weight on drivers	366,700 lb.	Grate area	72.2 sq. ft.
Weight on front truck	23,200 lb.	Steam pressure	210 lb.
Weight on trailing truck	45,000 lb.	Evaporative heating surface	4,830 sq. ft.
Total weight of engine	434,900 lb.	Superheating surface (Type A)	991 sq. ft.
Weight of tender, ⅔ loaded	164,500 lb.	Tender capacity	12,000 gal., 16 tons

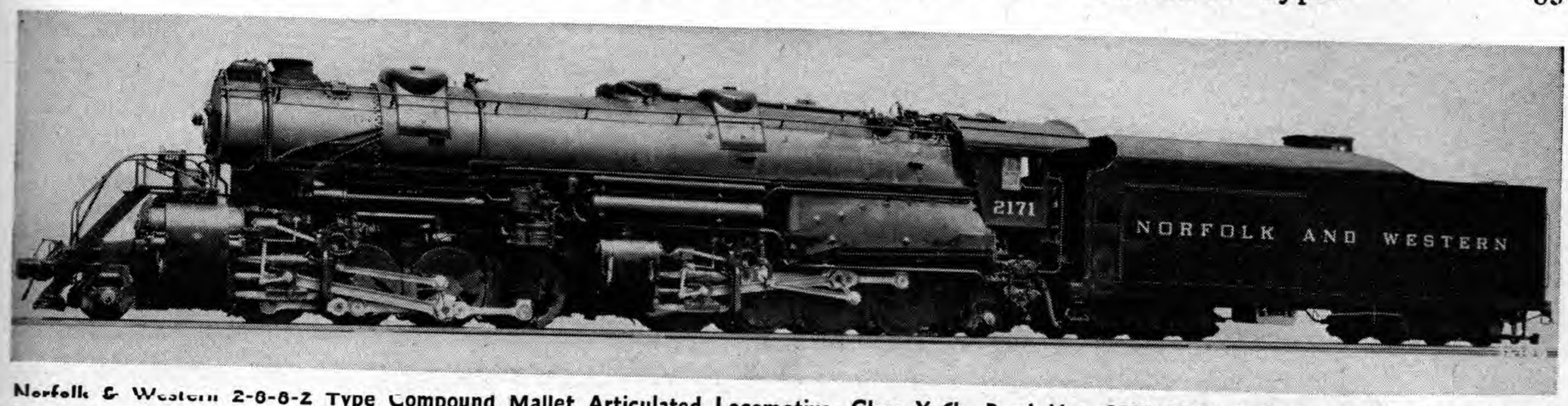
D. M. & I. R. Class M-4 articulated locomotive built by The Baldwin Locomotive Works. Road Nos. 228-237.

Rated tractive force	140,000 lb.	Total engine wheel base	67 ft. 2 in.
Cylinders, diameter and stroke (4)	26 in. x 32 in.	Total engine and tender wheel base	113 ft. 4⅜ in.
Drivers, diameter	63 in.	Fuel	Soft coal
Weight on drivers	565,000 lb.	Firebox, length and width	210⅛ in. x 102¼ in.
Weight on front truck	41,350 lb.	Grate area (192 in. long)	125 sq. ft.
Weight on trailing truck	93,350 lb.	Steam pressure	240 lb.
Total weight of engine	699,700 lb.	Evaporative heating surface	726 + 6,032 = 6,758 sq. ft.
Weight of tender, loaded	438,300 lb.	Superheating surface (Type E)	2,770 sq. ft.
Driving wheel base	17 ft. 3 in. and 17 ft. 3 in.	Tender capacity	25,000 gal. water—26 tons coal



Clinchfield 4-6-6-4 Type Single-Expansion Articulated Locomotive. Road Nos. 650-657 and 660-663. Built by the American Locomotive Company.

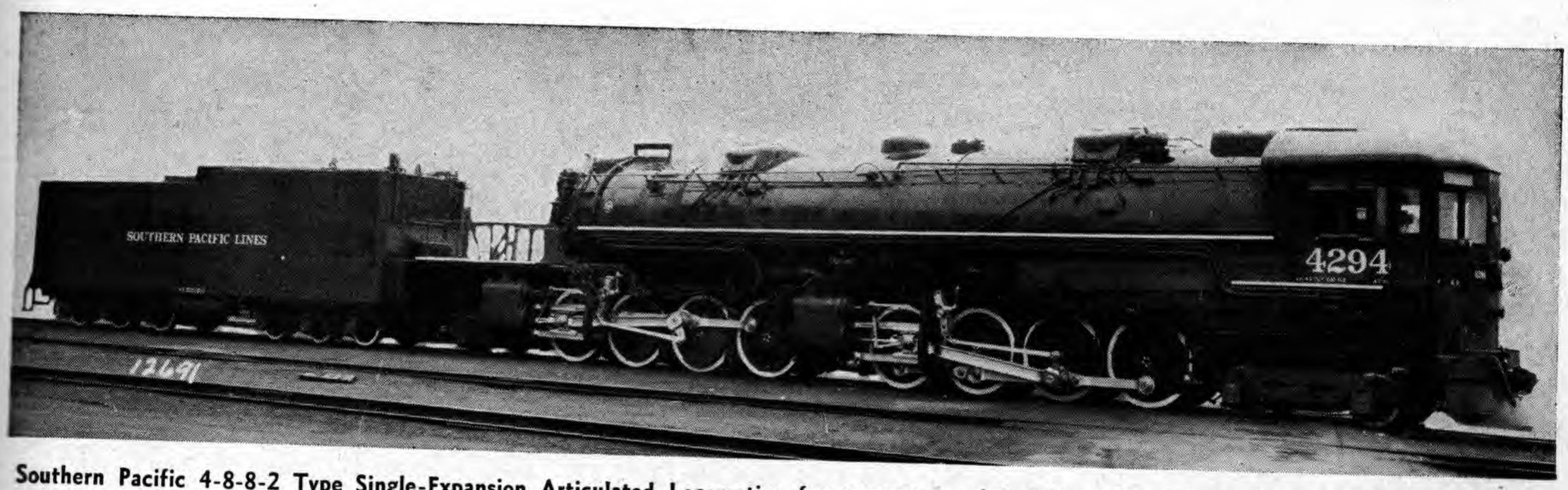
Tractive force	101,120 lb.	Driving wheel base, each	12 ft. 2 in.
Cylinders, diameter and stroke (4)	22 in. by 32 in.	Total engine wheel base	59 ft. 11 in.
Drivers, diameter	69 in.	Fuel	Soft coal
Weight on drivers	420,000 lb.	Grate area	108 sq. ft.
Weight on front truck	79,000 lb.	Steam pressure	265 lb.
Weight on trailing truck	108,000 lb.	Evaporative heating surface	636 + 4,756 = 5,392 sq. ft.
Total weight of engine	607,000 lb.	Superheating surface	1,680 sq. ft.
Weight of tender, ⅔ loaded	316,900 lb.	Tender capacity	22.500 gal., 26 tons



Norfolk & Western 2-8-8-2 Type Compound Mallet Articulated Locomotive. Class Y-6b. Road Nos. 2171-2187. Built by the N. & W. at the Roanoke Shops.

Tractive force, simple	152,206 lb.	Driving wheel base, each	15 ft. 9 in.
Tractive force, compound	126,838 lb.	Total engine wheel base	58 ft. 0 in.
Cylinders, diameter and stroke (4)	25 in. & 39 in. x 32 in.	Boiler diameter, maximum	102½ in. I. D.
Drivers, diameter	58 in.	Fuel	Soft coal
Weight on drivers	522.850 lb.	Grate area	106.2 sq. ft.
Weight on front truck	32,200 lb.	Steam pressure	300 lb.
Weight on trailing truck	27,850 lb.	Evaporative heating surface	4,915 sq. ft.
Total weight of engine	582,900 lb.	Superheating surface (Type A)	1,478 sq. ft.
Weight of tender, loaded	378,600 lb.	Tender Capacity	22,000 gal., 30 tons

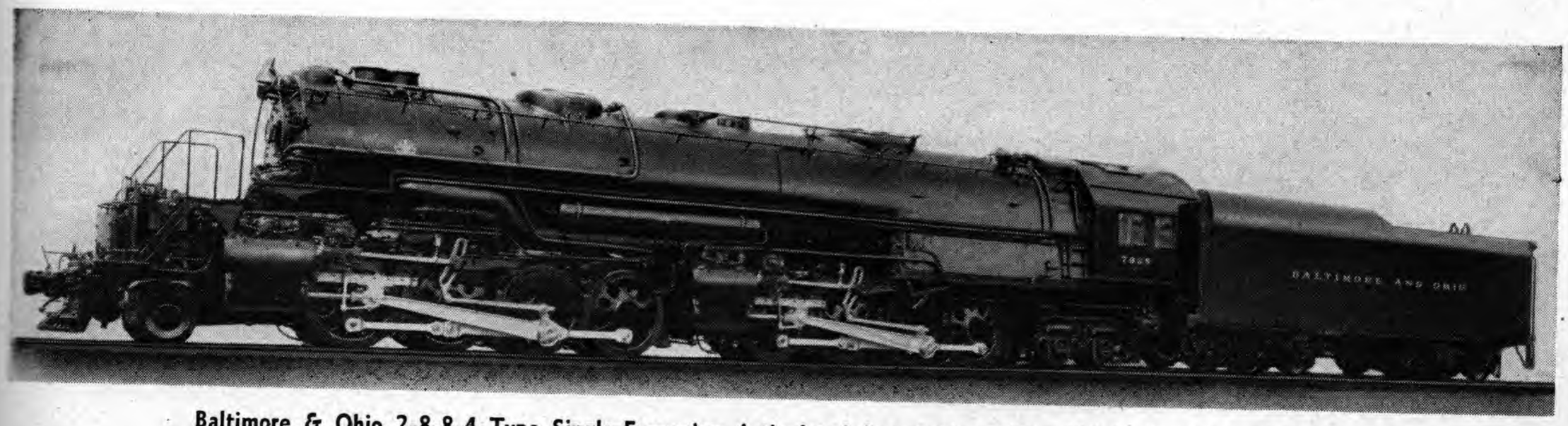
Note: Earlier locomotives, Classes Y-6 and Y-6a, Road Nos. 2120-2170.



Southern Pacific 4-8-8-2 Type Single-Expansion Articulated Locomotive for passenger and freight service. Classes AC-8 to AC-12. Road Nos. 4177-4294. Built by The Baldwin Locomotive Works.

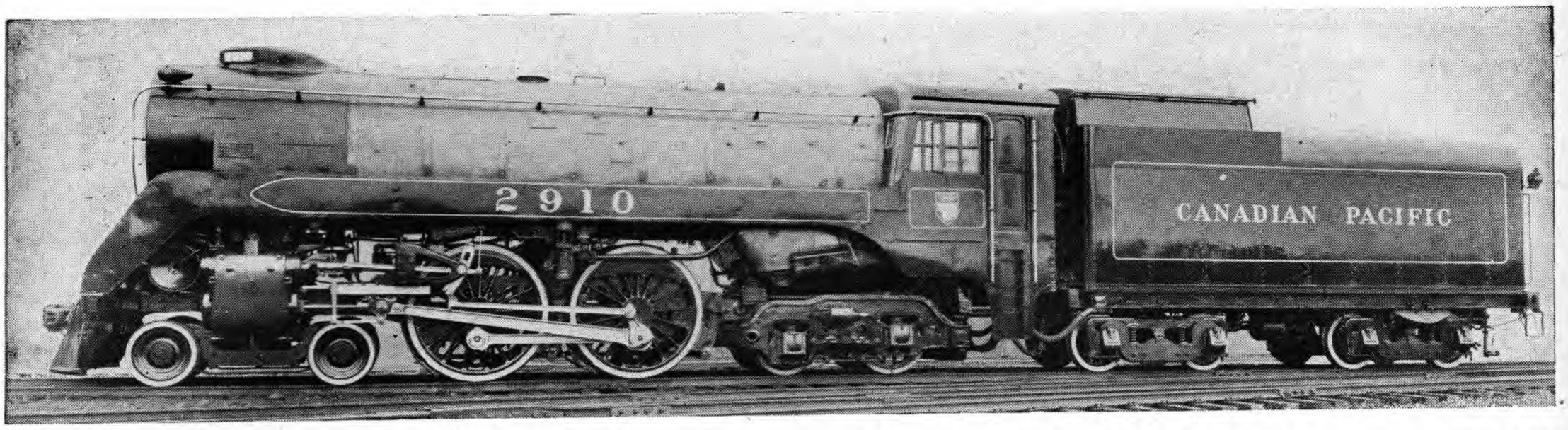
Description: *Railway Age*, February 3, 1940

Tractive force	124,300 lb.	Driving wheel base, each	16 ft. 11 in.
Cylinders, diameter and stroke (4)	24 in. x 32 in.	Total engine wheel base	67 ft. 3 in.
Drivers, diameter	63½ in.	Fuel	Oil
Weight on drivers	531,700 lb.	Grate area	139 sq. ft.
Weight on front truck	76,400 lb.	Steam pressure	250 lb.
Weight on trailing truck	49,800 lb.	Evaporative heating surface	478 + 5,992 = 6,470 sq. ft.
Total weight of engine	657,900 lb.	Superheating surface (Type E)	2,616 sq. ft.
Weight of tender, ⅔ loaded	315,500 lb.	Tender capacity	22,000 gal. water, 6,100 gal. oil



Baltimore & Ohio 2-8-8-4 Type Single-Expansion Articulated Locomotive. Class EM-1, Road Nos. 7600-7629. Built by The Baldwin Locomotive Works.

Tractive force	115,000 lb.	Driving wheel base, each	11 ft. 2 in.
Cylinders, diameter and stroke (4)	24 in. x 32 in.	Total engine wheel base	65 ft. 2 in.
Drivers, diameter	64 in.	Fuel	Soft coal
Weight on drivers	485,000 lb.	Grate area	117.5 sq. ft.
Weight on front truck	50,700 lb.	Steam pressure	235 lb.
Weight on trailing truck	93,000 lb.	Evaporative heating surface	756 + 4,542 = 5,298 sq. ft.
Total weight of engine	628,700 lb.	Superheating surface (Type A)	2,118 sq. ft.
Weight of tender, 2/3 loaded	304,000 lb.	Tender capacity	22,000 gal. water, 25 tons coal



Canadian Pacific 4-4-4 Type Locomotive for Passenger Service. Class F-1a; Road Nos. 2910-2929. Built by the Canadian Locomotive Company, Ltd.

Tractive force	26,000 lb.
Cylinders, diameter and stroke	16½ in. x 28 in.
Drivers, diameter	75 in.
Weight on drivers	111,250 lb.
Weight on front truck	52,880 lb.
Weight on trailing truck	75,000 lb.
Total weight of engine	239,130 lb.
Weight of tender, loaded	183,100 lb.
Driving wheel base	7 ft. 2 in.
Total engine wheel base	32 ft. 7 in.
Fuel	Soft coal
Grate area	45 sq. ft.
Steam pressure	300 lb.
Evaporative heating surface	200 + 2,091 = 2,291 sq. ft.
Superheating surface (Type E)	900 sq. ft.
Tender capacity	9,250 U. S. gal., 12 tons

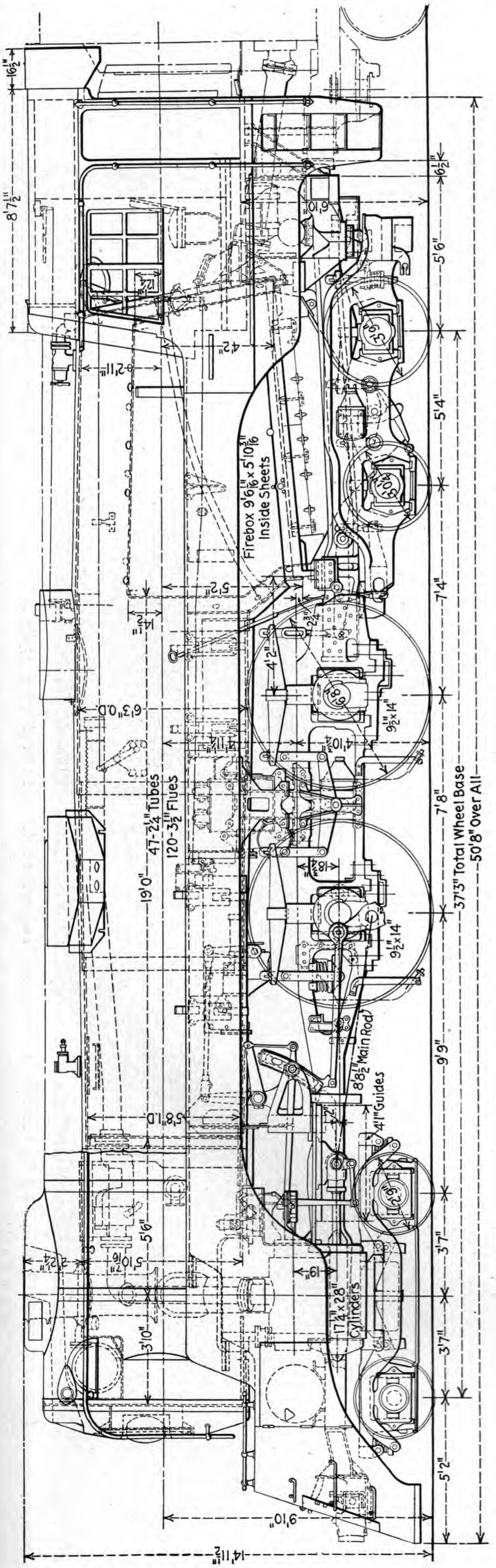
Canadian Pacific 4-4-4 Type Streamlined Locomotive, Class F-2a, Road Nos. 3000-3004. Built by Montreal Locomotive Works, Ltd.

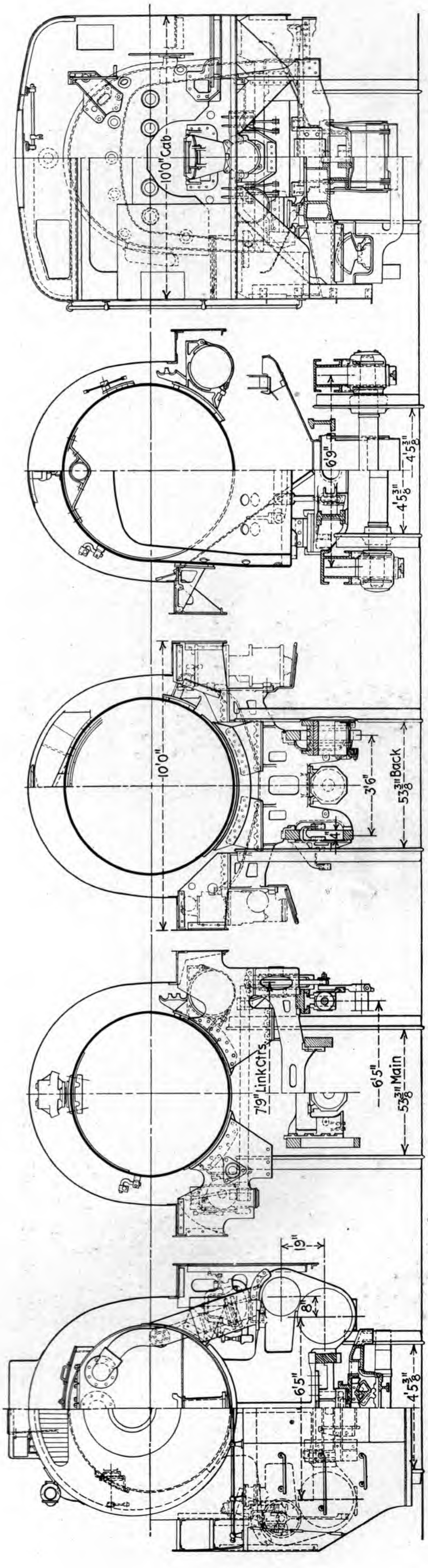
Description: *Railway Mechanical Engineer,* November, 1936; *Railway Age,* October 3, 1936

Tractive force	26,500 lb.
Cylinders, diameter and stroke	17¼ in. x 28 in.
Drivers, diameter	80 in.
Weight on drivers	121,000 lb.
Weight on front truck	68,000 lb.
Weight on trailing truck	74,000 lb.
Total weight of engine	263,000 lb.
Weight of tender, loaded	198,500 lb.
Driving wheel base	7 ft. 8 in.
Total engine wheel base	37 ft. 3 in.
Fuel	Soft coal
Grate area	55.6 sq. ft.
Steam pressure	300 lb.
Evaporative heating surface	232 + 2,601 = 2,833 sq. ft.
Superheating surface (Type E)	1,100 sq. ft.
Tender capacity	8,400 U. S. gal., 12 tons

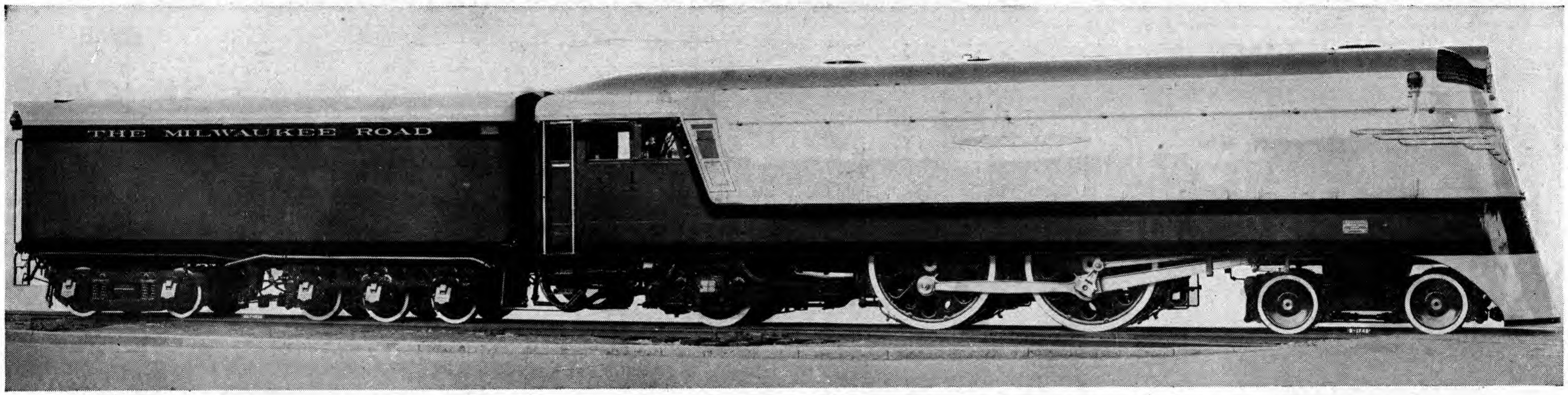
Pennsylvania Railroad 4-4-2 (Atlantic) Type Locomotive, Class E6s, for Passenger Service.

Tractive force	31,275 lb.
Cylinders, diameter and stroke	23½ in. x 26 in.
Drivers, diameter	80 in.
Weight on drivers	136,000 lb.
Weight on front truck	55,200 lb.
Weight on trailing truck	52,400 lb.
Total weight of engine	243,600 lb.
Weight of tender, loaded	169,150 lb.
Boiler diameter	76¾ in.
Driving wheel base	7 ft. 5 in.
Total engine wheel base	29 ft. 9 in.
Boiler type	Belpaire wide
Fuel	Soft coal
Grate area	55.2 sq. ft.
Steam pressure	205 lb.
Evaporative heating surface	218 + 2,678 = 2,896 sq. ft.
Superheating surface (Type A)	613 sq. ft.
Tender capacity (70-P-66-F)	7,400 gal., 13 tons

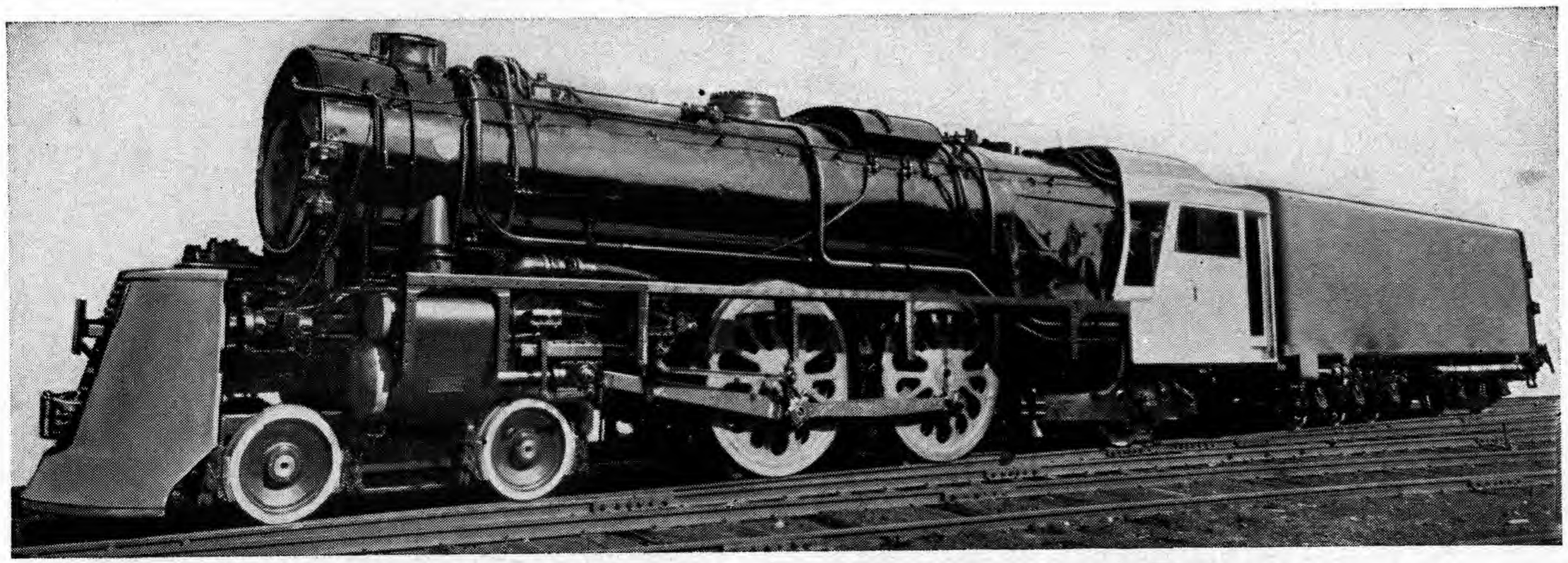




Canadian Pacific 4-4-4 Type Streamlined Locomotive, Class F-2a, Road Nos. 3000-3004—Elevation and Cross Sections. Built by Montreal Locomotive Works, Ltd.



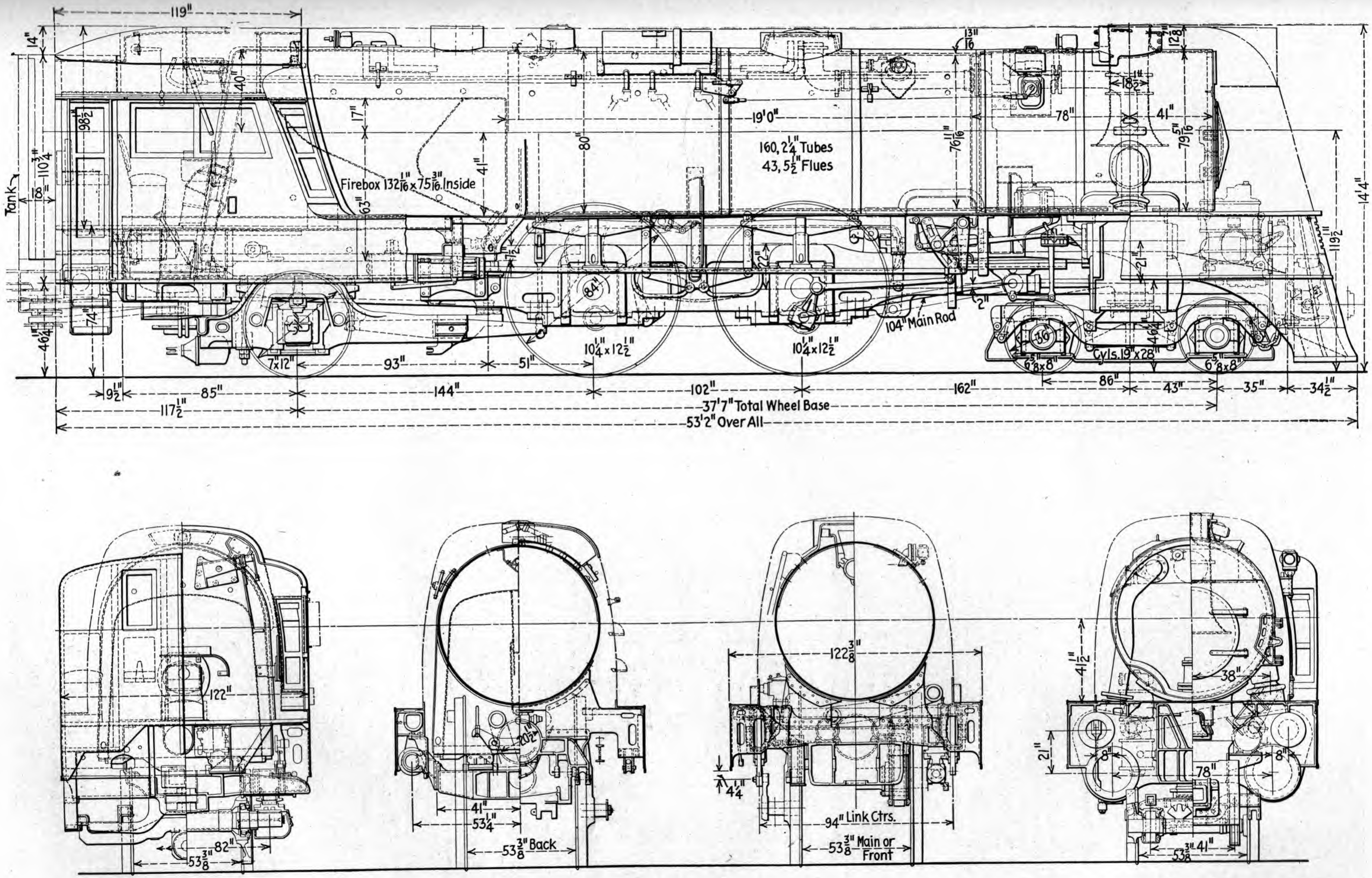
Chicago, Milwaukee, St. Paul & Pacific 4-4-2 Type Streamlined for "Hiawatha" T rains. Class A-2, Road Nos. 1-4. Built by the American Locomotive Company



View of C. M. St. P. & P. 4-4-2 Type Streamlined "Hiawatha" Locomotive before the shrouding was applied.

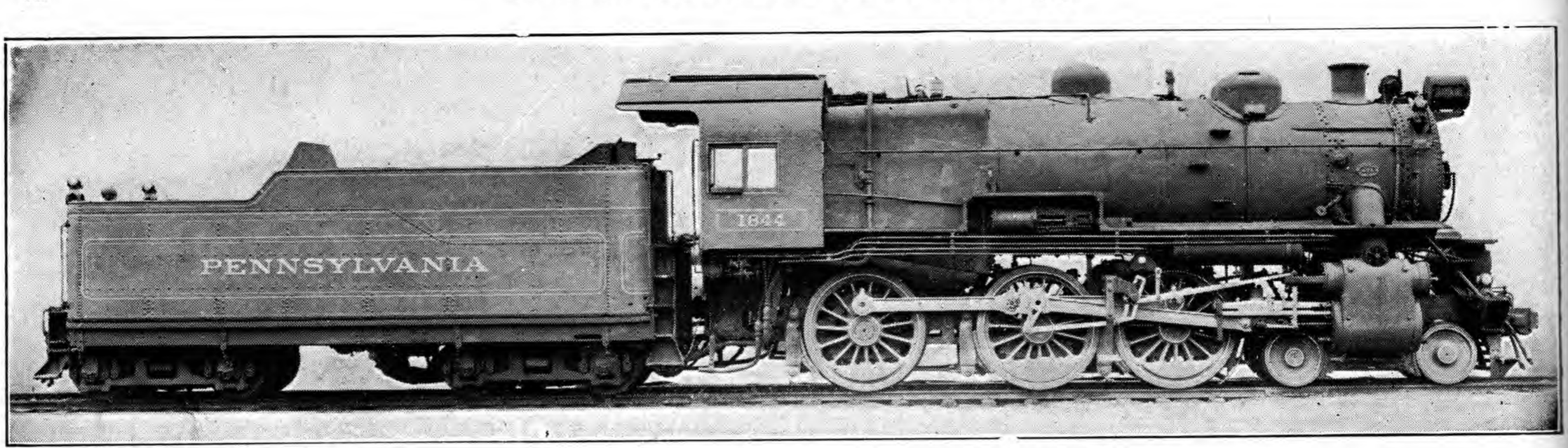
Dimensions and Weights

Tractive force	30,700 lb.
Cylinders, diameter and stroke	19 in. x 28 in.
Drivers, diameter	84 in.
Weight on drivers	144,300 lb.
Weight on front truck	72,700 lb.
Weight on trailing truck	73,000 lb.
Total weight of engine	290,000 lb.
Weight of tender	266,300 lb.
Driving wheel base	8 ft. 6 in.
Total engine wheel base	37 ft. 7 in.
Fuel	Oil
Grate area	69 sq. ft.
Steam pressure	300 lb.
Evaporative heating surface	294 + 2,951 = 3,245 sq. ft.
Superheating surface (Type A)	157 sq. ft.
Tender capacity	13,000 gal. water, 4,000 gal. oil



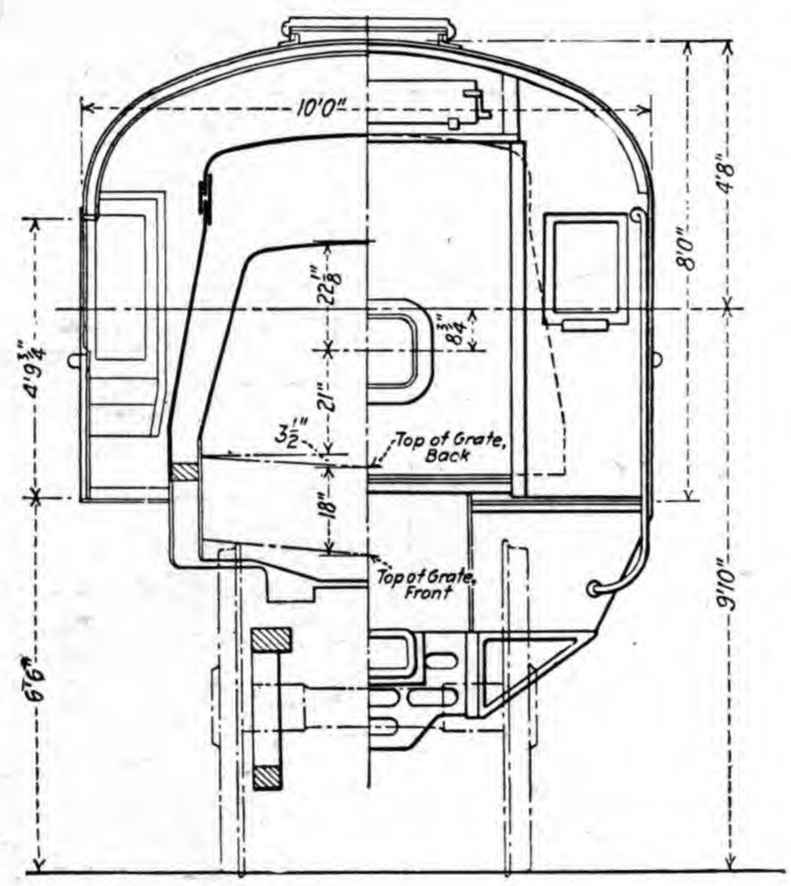
Chicago, Milwaukee, St. Paul & Pacific 4-4-2 Type Streamlined Locomotive for "Hiawatha" Trains, Road Nos. 1-4—Elevation and Cross Sections. Built by American Locomotive Company.

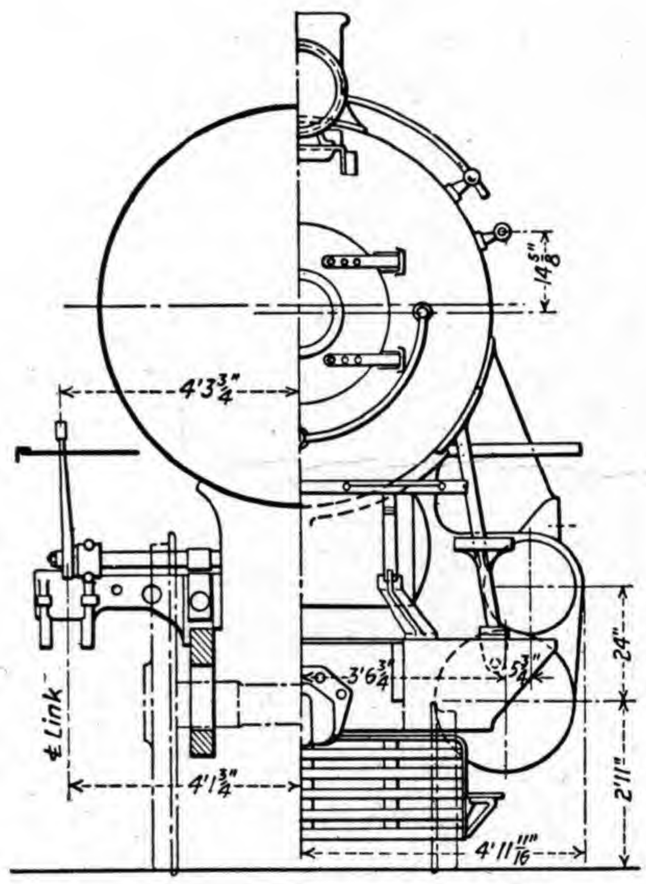
Description: *Railway Mechanical Engineer,* June, 1935; *Railway Age,* May 11, 1935

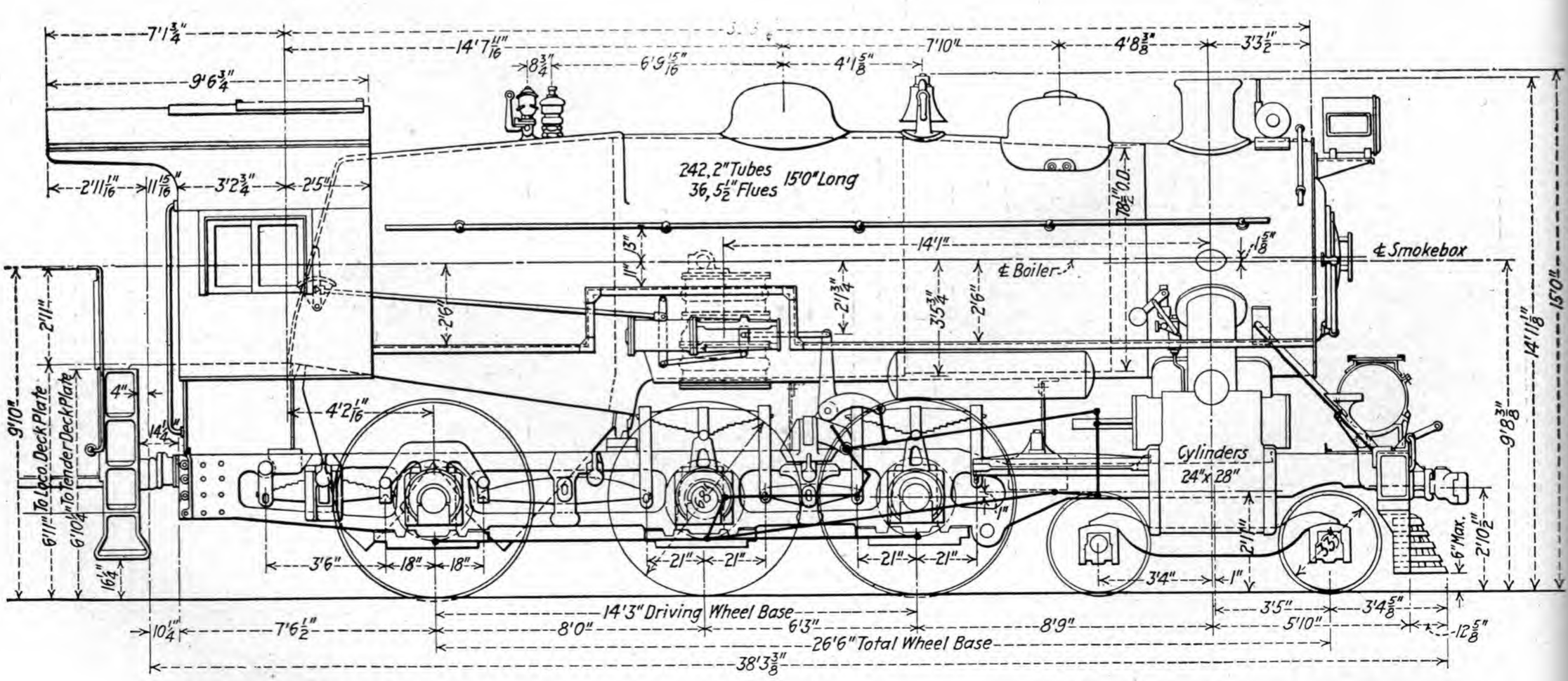


Pennsylvania Railroad 4-6-0 (Ten-Wheel) Type Locomotive, Class G5s, for Heavy Local Passenger Service.

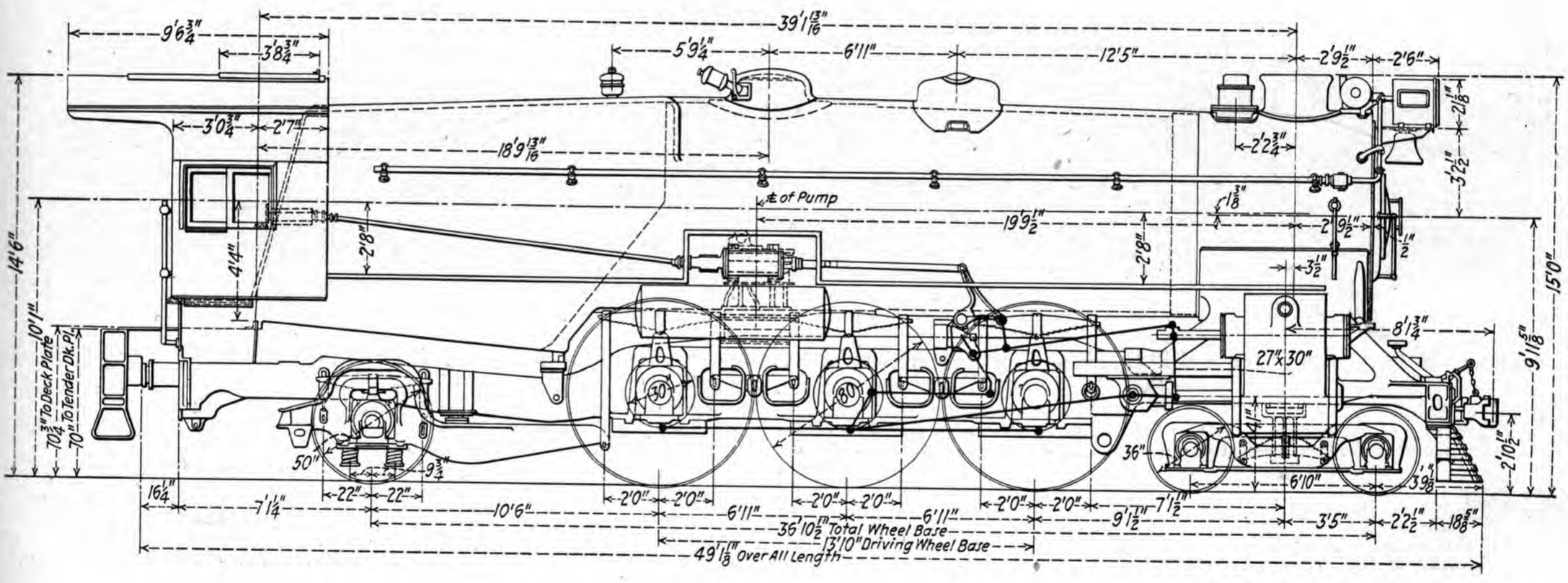
Tractive force	41,330 lb.
Cylinders, diameter and stroke	24 in. x 28 in.
Drivers, diameter	68 in.
Weight on drivers	178,000 lb.
Weight on front truck	59,000 lb.
Total weight of engine	237,000 lb.
Weight of tender, loaded	172,900 lb.
Driving wheel base	14 ft. 3 in.
Total engine wheel base	26 ft. 6 in
Fuel	Soft coal
Grate area	55.2 sq. ft.
Gas area, tubes and flues	6.96 sq. ft.
Steam pressure	205 lb.
Evaporative heating surface	177 + 2678 = 2855 sq. ft.
Superheating surface (Type A)	613 sq. ft.
Tender capacity	8,300 gal., 12 tons

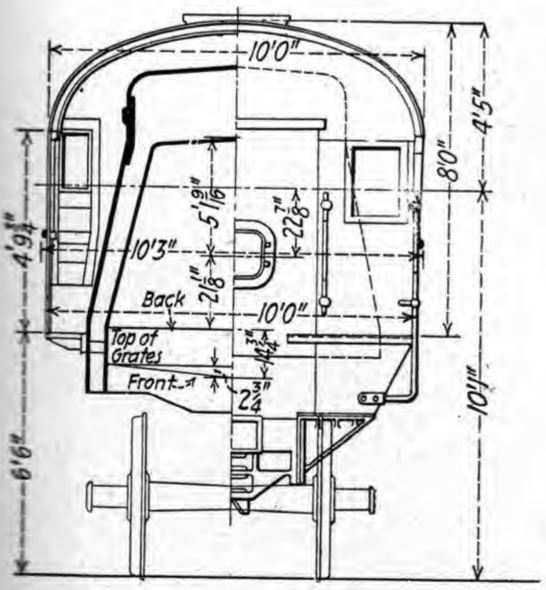






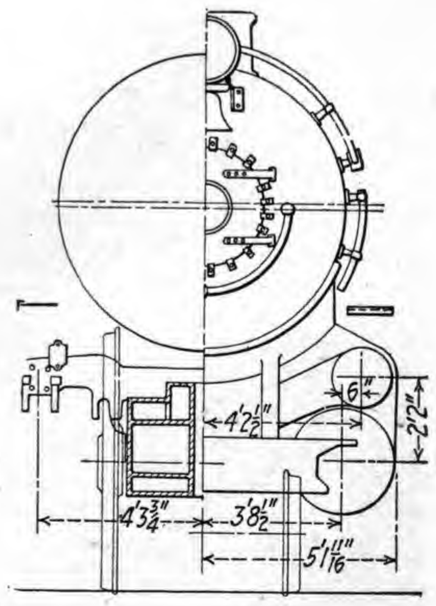
Pennsylvania Railroad 4-6-0 (Ten-Wheel) Type Passenger Locomotive, Class G5s-Elevation and Cross Sections.





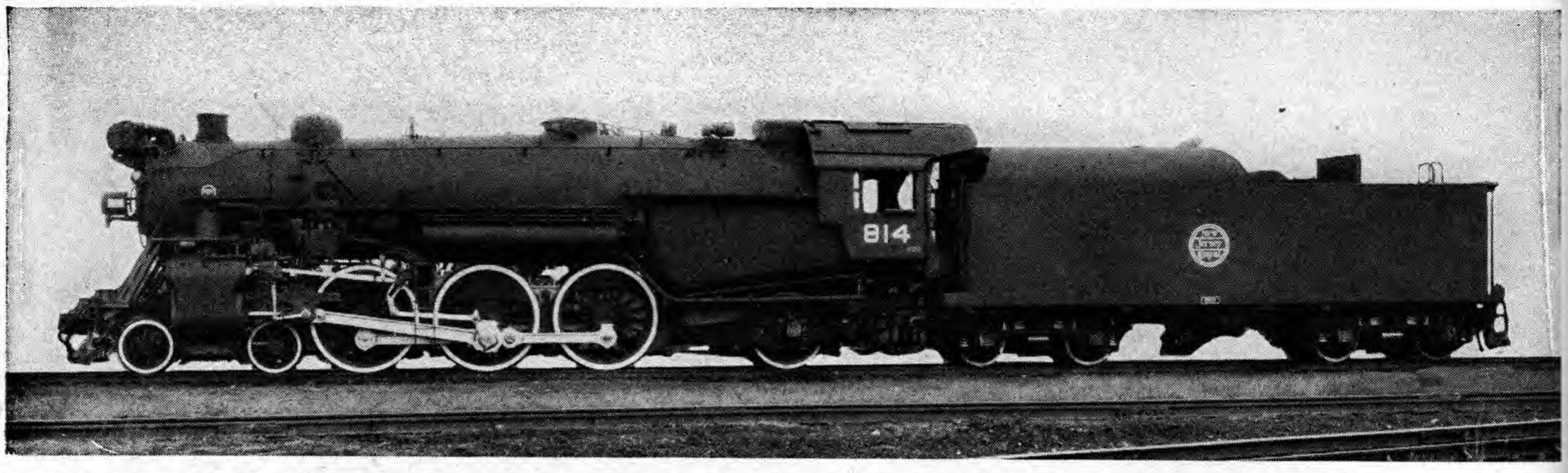
Pennsylvania Railroad 4-6-2 (Pacific) Type Locomotive, Class K-5, for Passenger Service. Equipped with Limited Cutoff, Type E Superheater, Worthington Feedwater Heater and Nickel Steel Boiler Shell.

Note: A few changes have been made—all drivers are now flanged and stoker has been added.



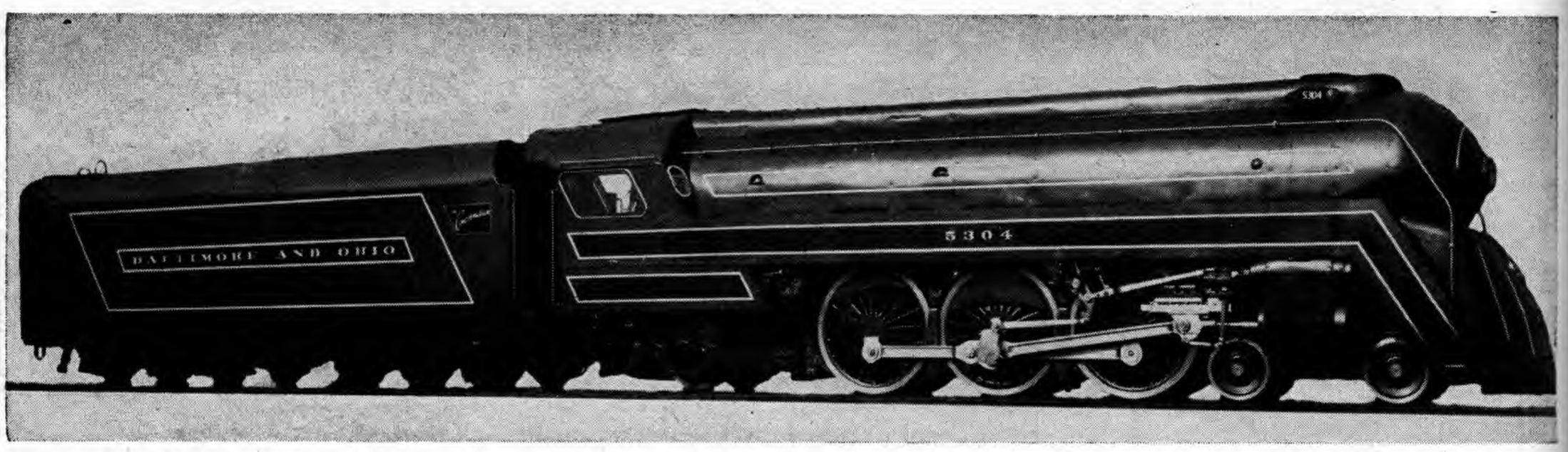
Dimensions, Weights and Proportions of Pennsylvania 4-6-2 Type Locomotive, Class K-5.

Tractive force, 80 per cent	54,675 lb.	Driving wheel base	13 ft. 10 in.
Cylinders, diameter and stroke	27 in. x 30 in.	Total engine wheel base	36 ft. 10½ in.
Drivers, diameter	80 in.	Fuel	Soft coal
Weight on drivers	208,250 lb.	Grate area	69.89 sq. ft.
Weight on front truck	59,320 lb.	Steam pressure	250 lb.
Weight on trailing truck	59,900 lb.	Evaporative heating surface	305 + 3980 = 4285 sq. ft.
Total weight of engine	327,560 lb.	Superheating surface (Type E)	1634 sq. ft.
Weight of tender, loaded	244,900 lb.	Tender capacity	14,125 gal., 17.8 tons



Central Railroad of New Jersey 4-6-2 (Pacific) Type Locomotive for Passenger Service. Class G4s; Road Nos. 810-814. Built by The Baldwin Locomotive Works.

Tractive force	52,180 lb.	Driving wheel base	13 ft. 10 in.
Cylinders, diameter and stroke	26 in. x 28 in.	Total engine wheel base	36 ft. 8 in.
Drivers, diameter	74 in.	Fuel	Soft coal
Weight on drivers	205,900 lb.	Grate area	84.3 sq. ft.
Weight on front truck	63,830 lb.	Steam pressure	240 lb.
Weight on trailing truck	64,100 lb.	Evaporative heating surface	401 + 3189 = 3590 sq. ft.
Total weight of engine	333,830 lb.	Superheating surface (Type A)	1000 sq. ft.
Weight of tender, loaded	253,870 lb.	Tender capacity	13,500 gal.—15 tons

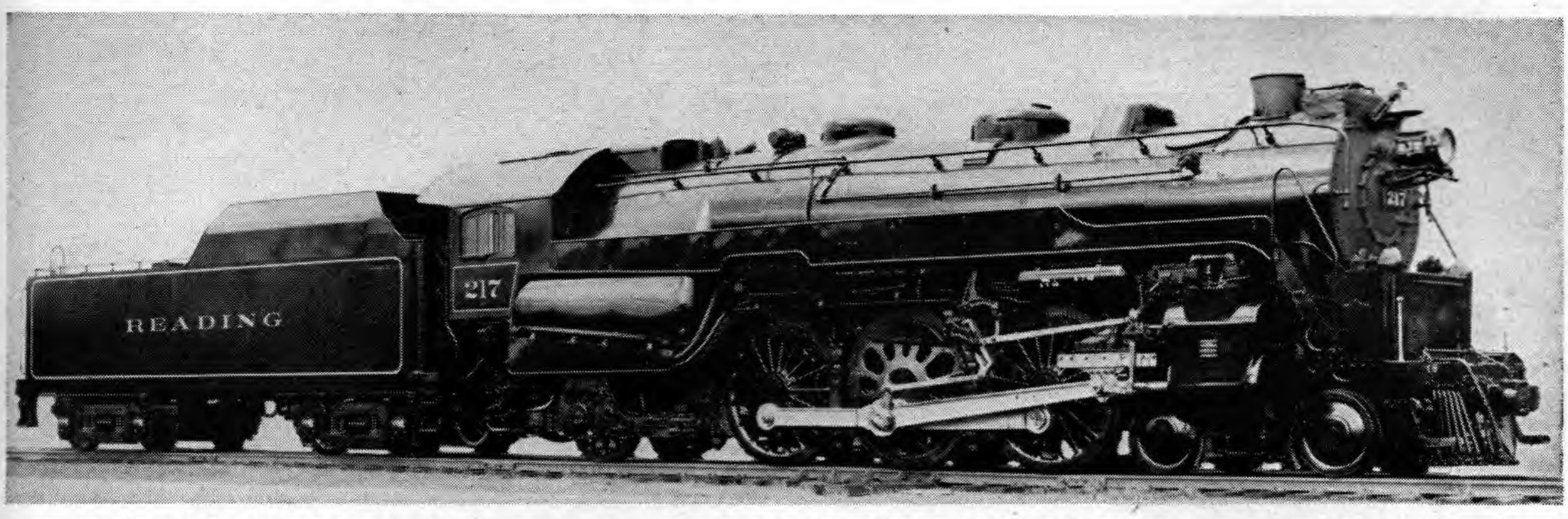


Baltimore & Ohio streamlined 4-6-2 (Pacific) Type Locomotive for "Cincinnatian" Passenger Service. Class P-7-d; Road Nos. 5301-5304. Built at the Mt. Clare Shops.

Tractive force, engine	50,000 lb.	Driving wheel base	14 ft. 0 in.
Cylinders, diameter and stroke	27 in. x 28 in.	Total engine wheel base	37 ft. 1 in.
Drivers, diameter	80 in.	Fuel	Soft coal
Weight on drivers	211,000 lb.	Grate area	70.3 sq. ft.
Weight on front truck	70,000 lb.	Steam pressure	250 lb.
Weight on trailing truck	66,500 lb.	Evaporative heating surface	429 + 3414 = 3843 sq. ft.
Total weight of engine	347,500 lb.	Superheating surface (Type R)	950 sq. ft.
Weight of tender, loaded	366,000 lb.	Tender capacity	20,000 gal., 25 tons

One of 10 Alton modernized light 4-6-2 (Pacific) Type Locomotives for Passenger Service. Class P-16b (modernized). Equipped with Worthington feedwater heaters, Thermic syphons, Type HA superheaters and Foameters.

For test results see *Railway Mechanical Engineer,* January 1945

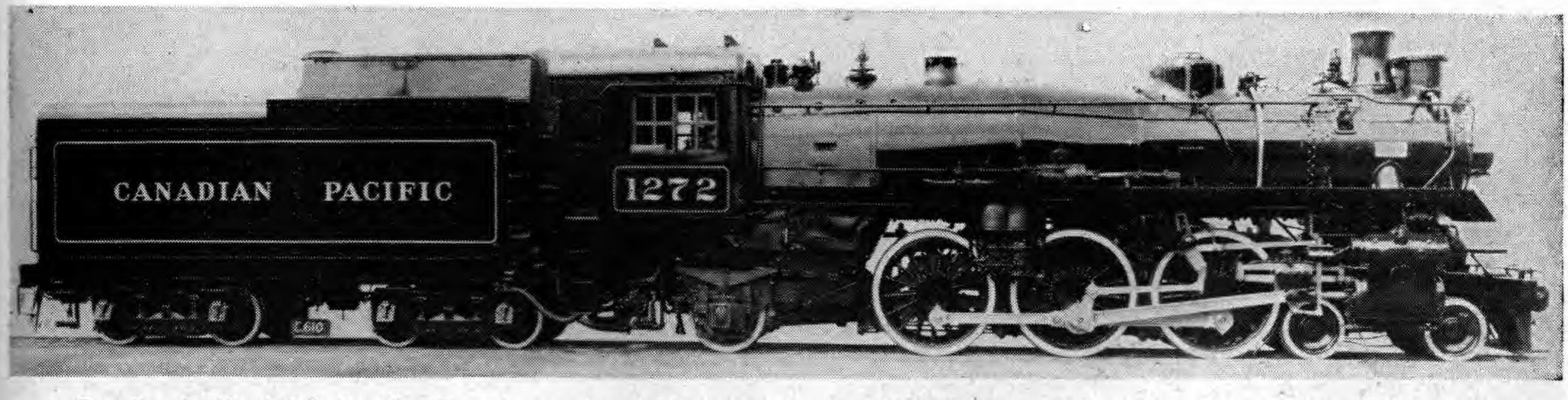


Reading 4-6-2 (Pacific) Type Locomotive for Passenger Service. Class G-3; Road Nos. 210-219. Built by Reading Shops, 1948.

Tractive force	48,340 lb.
Cylinders, diameter and stroke	25 in. x 28 in.
Drivers, diameter	80 in.
Weight on drivers	197,184 lb.
Weight on front truck	63,222 lb.
Weight on trailing truck	69,044 lb.
Total weight of engine	329,450 lb.
Weight of tender, loaded	257,540 lb.
Driving wheel base	13 ft. 10 in.
Wheel base, engine and tender	78 ft. 3¾ in.
Total engine wheel base	36 ft. 7 in.
Fuel	Soft coal
Grate area	95 sq. ft.
Steam pressure	260 lb.
Evaporative heating surface	431 + 2,552 = 2,983 sq. ft.
Superheating surface (Type A)	770 sq. ft.
Tender capacity	12,500 gal., 19 tons

Canadian Pacific 4-6-2 (Pacific) Type Locomotive for Passenger Service. Class G-3j, Road Nos. 2463-2472. Built by Montreal Locomotive Works, Ltd.

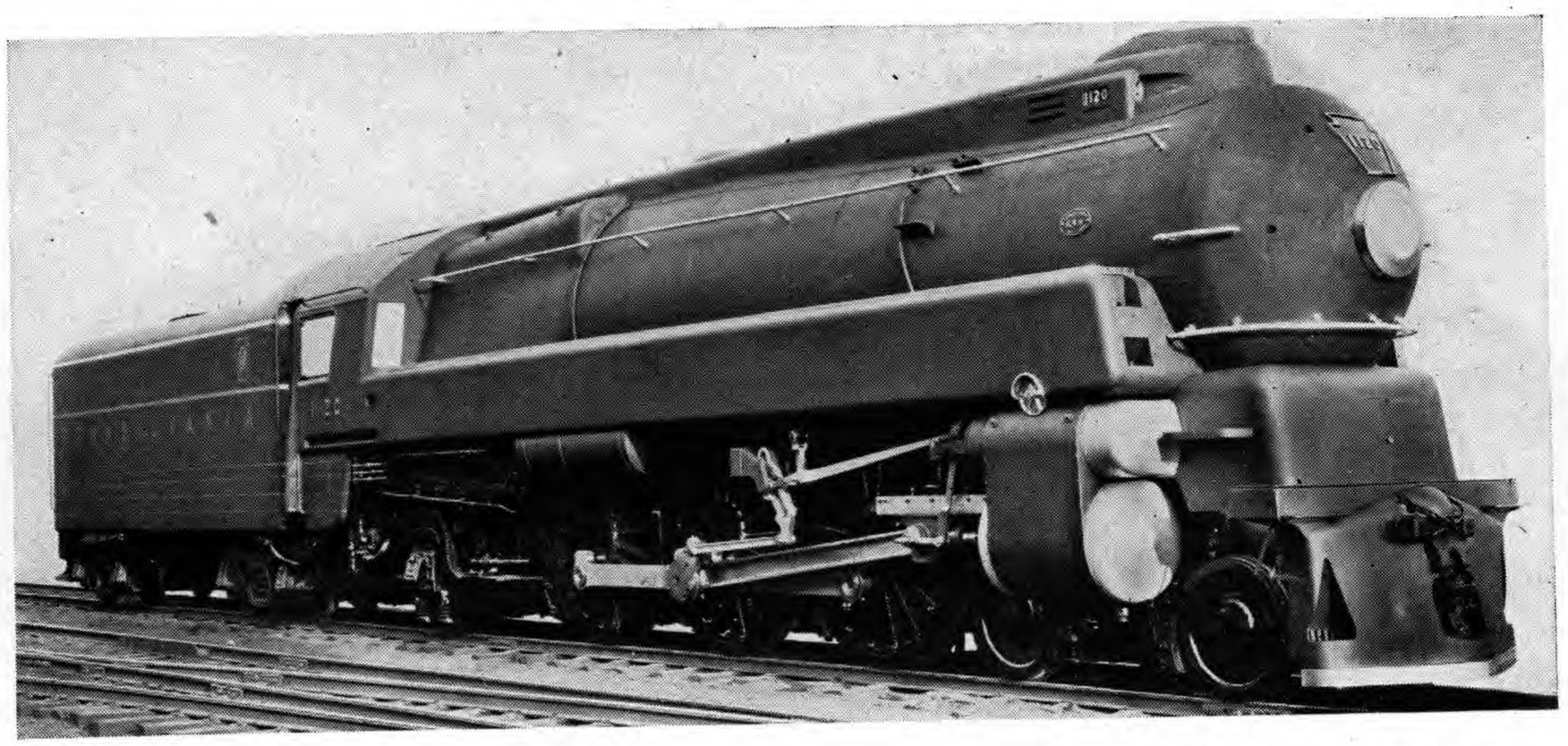
Tractive force	45,000 lb.
Cylinders, diameter and stroke	22 in. x 30 in.
Drivers, diameter	75 in.
Weight on drivers	197,500 lb.
Weight on front truck	58,000 lb.
Weight on trailing truck	63,500 lb.
Total weight of engine	319,000 lb.
Weight of tender, loaded	238,000 lb.
Driving wheel base	13 ft. 2 in.
Total engine wheel base	35 ft. 0 in.
Fuel	Soft coal
Grate area	65 sq. ft.
Steam pressure	275 lb.
Evaporative heating surface	288 + 2,887 = 3,175
Superheating surface (Type T4)	1,380 sq. ft.
Tender capacity	10,000 Imp. gal., 18 tons



Canadian Pacific 4-6-2 (Pacific) Type Locomotive for Passenger Service. Class G-5d; Road Nos. 1272-1301. Built by the Canadian Locomotive Co., Ltd.

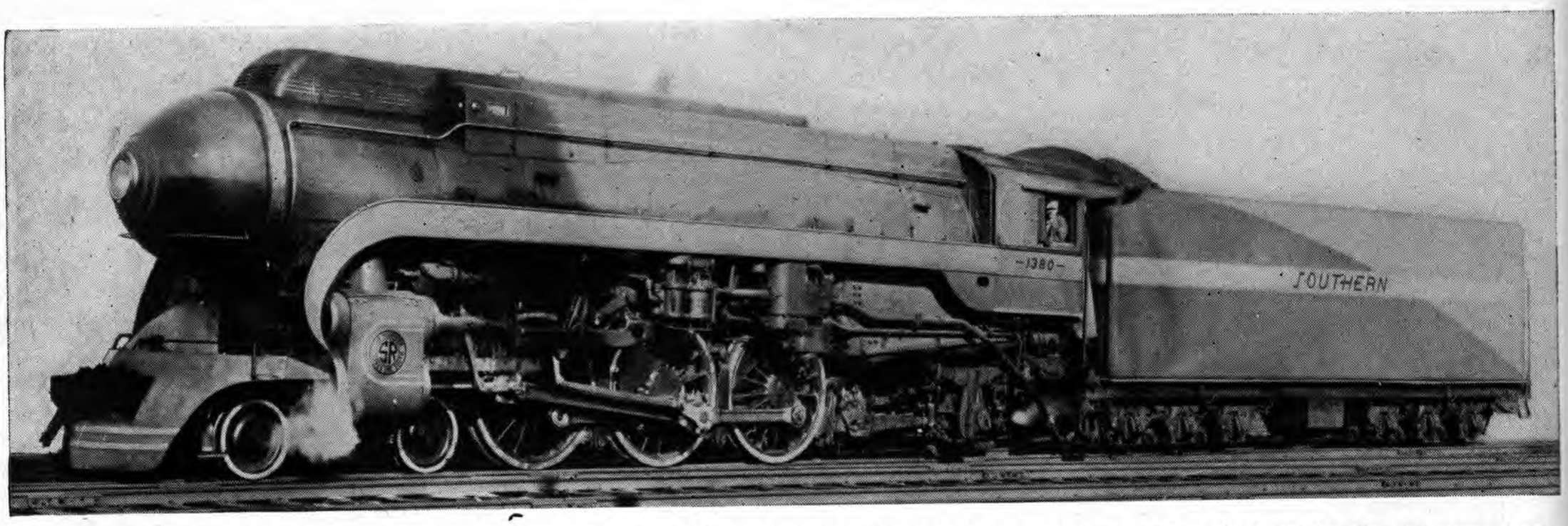
Description: *Railway Age,* June 10, 1944; *Railway Mechanical Engineer,* July 1944 (Brief)

Tractive force	34,000 lb.
Cylinders, diameter and stroke	20 in. x 28 in.
Drivers, diameter	70 in.
Weight on drivers	152,500 lb.
Weight on front truck	39,500 lb.
Weight on trailing truck	42,000 lb.
Total weight of engine	234,000 lb.
Weight of tender, loaded	188,000 lb.
Driving wheel base	13 ft. 0 in.
Total engine wheel base	33 ft. 8½ in.
Fuel	Soft coal
Grate area	45.6 sq. ft.
Steam pressure	250 lb.
Evaporative heating surface	199 + 2,377 = 2,576 sq. ft.
Superheating surface (Type A)	744 sq. ft.
Tender capacity	8,000 Imp. gal., 14 tons

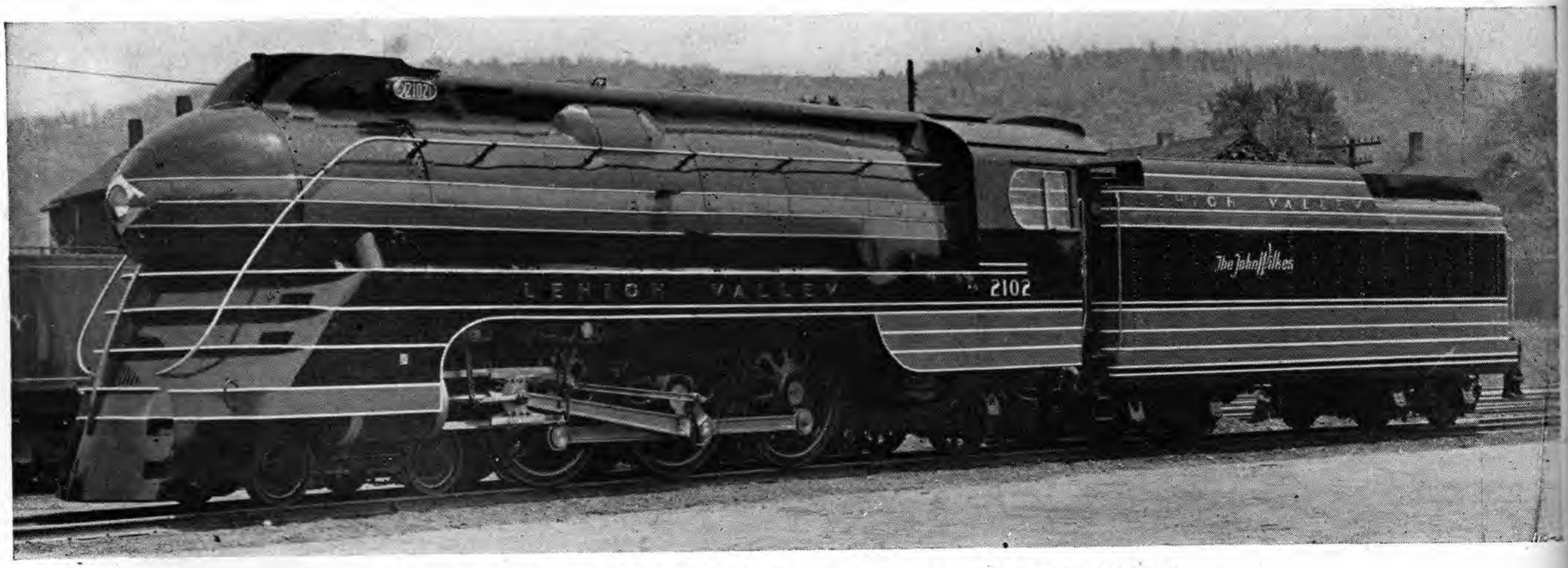


Pennsylvania 4-6-2 Type, Class K-4s, Streamlined Locomotive. Road Nos. 1120, 2665, 3678 and 5338.

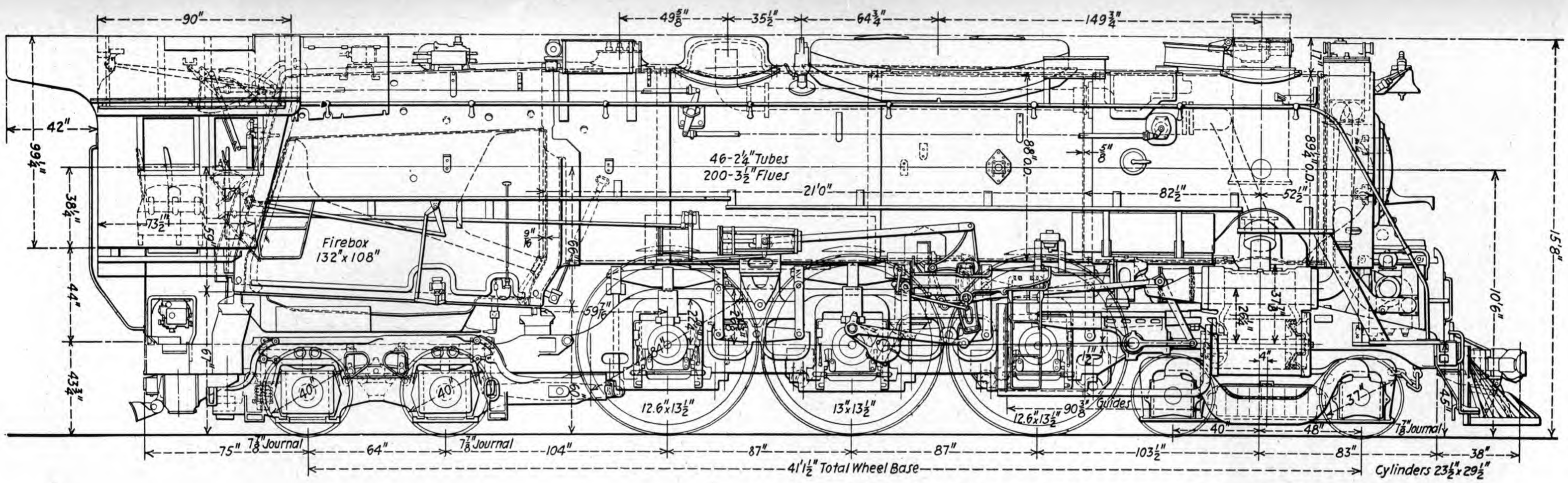
Tractive force	44,460 lb.
Cylinders, diameter and stroke	27 in. x 28 in.
Drivers, diameter	80 in.
Weight on drivers	218,200 lb.
Weight on front truck	58,500 lb.
Weight on trailing truck	57,600 lb.
Total weight of engine	334,300 lb.
Weight of tender, loaded	221,500 lb.
Driving wheel base	13 ft. 10 in.
Total engine wheel base	36 ft. 2 in.
Fuel	Soft coal
Grate area	69.89 sq. ft.
Steam pressure	205 lb.
Evaporative heating service	305 + 3,736 = 4,041 sq. ft.
Superheating surface (Type E)	943 sq. ft.
Tender capacity (110-P-75-A)	11,300 gal., 22 tons

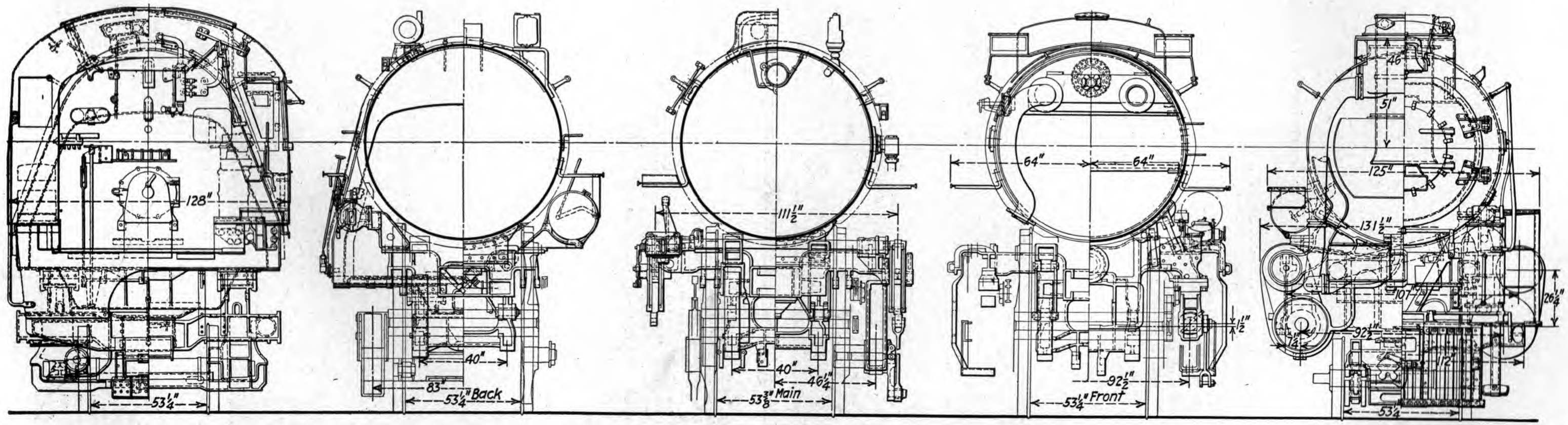


Southern Railway 4-6-2 (Pacific) Type Locomotive rebuilt, modernized and streamlined by the railroad. Originally built by the American Locomotive Company in 1923.



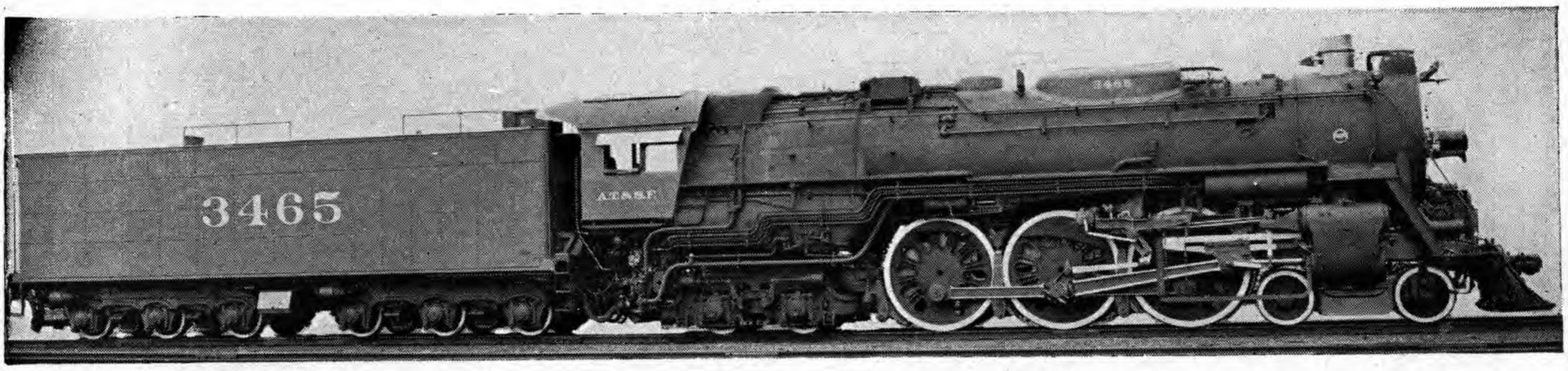
Lehigh Valley rebuilt 4-6-2 (Pacific) Type Locomotive the "John Wilkes."
Description: *Railway Age*, July 29, 1939





Atchison, Topeka & Santa Fe 4-6-4 Type Locomotive, 3460 Class, Road Nos. 3461-3465 (3460 Streamlined)—Elevation and cross-sections. Built by The Baldwin Locomotive Works.

Description: *Railway Mechanical Engineer*, March, 1938; *Railway Age*, March 12, 1938

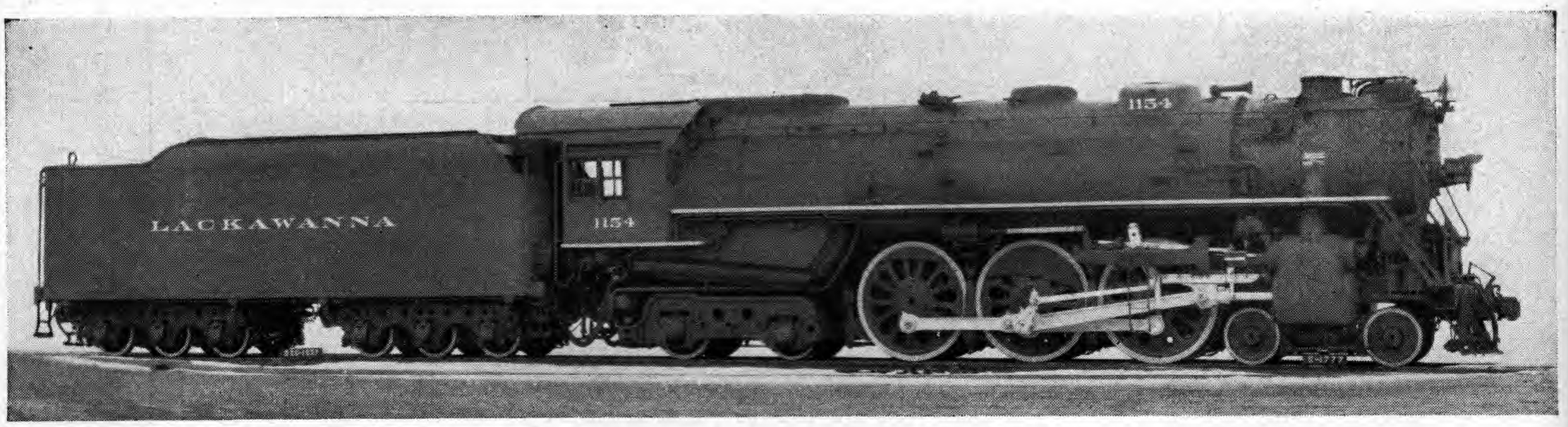


Atchison, Topeka & Santa Fe 4-6-4 Type Locomotive for Pessenger Service. Road Nos. 3460-3465. Built by The Baldwin Locomotive Works.

Tractive force	49,300 lb.	Driving wheel base	14 ft. 6 in.
Cylinders, diameter and stroke	23½ in. x 29½ in.	Total engine wheel base	4[illegible] ft. 1½ in.
Drivers, diameter	84 in.	Fuel	Oil
Weight on drivers	213,440 lb.	Grate area	98.5 sq. ft.
Weight on front truck	83,950 lb.	Steam pressure	300 lb.
Weight on trailing truck	114,990 lb.	Evaporative heating surface	375 + 4395 = 4770 sq. ft.
Total weight of engine	412,380 lb.	Superheating surface (Type E)	2080 sq. ft.
Weight of tender, loaded	396,340 lb.	Tender capacity	21,000 gal. water, 7000 gal. oil

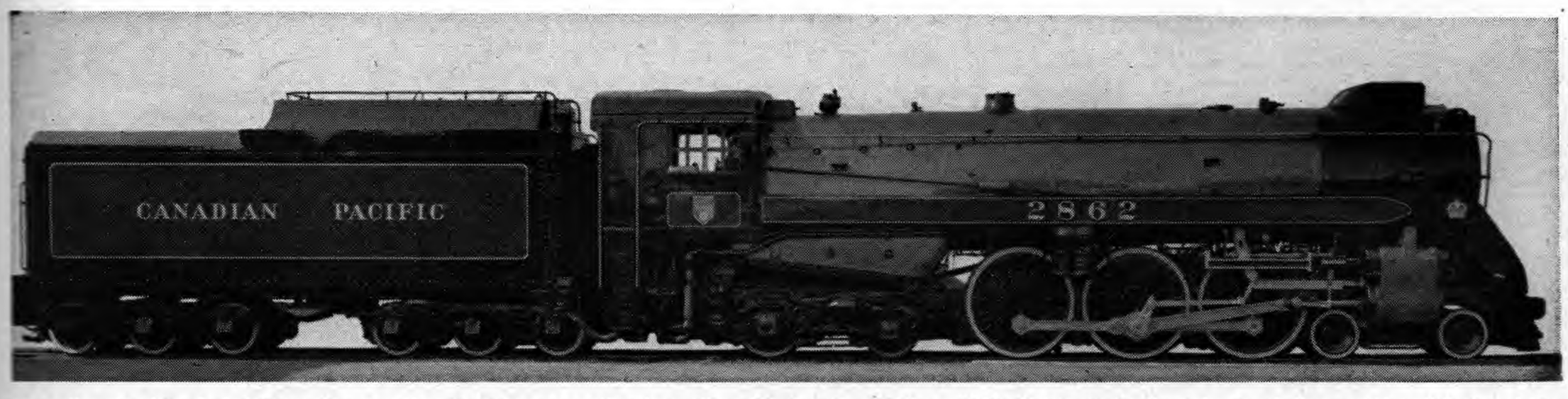
Canadian National 4-6-4 Type Lcoomotive for Passenger Service. Class K-5a; Road Nos. 5700-5704. Built by the Montreal Locomotive Works, Ltd.

Tractive force, engine	43,300 lb.	Driving wheel base	14 ft. 0 in.
Tractive force, booster	10,100 lb.	Total engine wheel base	40 ft. 2 in.
Cylinders, diameter and stroke	23 in. x 28 in.	Fuel	Soft coal
Drivers, diameter	80 in.	Grate area	73.7 sq. ft.
Weight on drivers	188,600 lb.	Steam pressure	275 lb.
Weight on front truck	66,000 lb.	Evaporative heating surface	345 + 3032 = 3377 sq. ft.
Weight on trailing truck	101,800 lb.	Superheating surface (Type E)	1492 sq. ft.
Total weight of engine	356,400 lb.	Tender capacity	14,000 Imp. gal., 20 tons



Delaware, Lackawanna & Western 4-6-4 Type Locomotive, Road Nos. 1151-1155. Built by the American Locomotive Company.
Description: *Railway Age,* February 19, 1938

Tractive force	52,800 lb.	Driving wheel base	14 ft. 0 in.
Cylinders, diameter and stroke	26 in. x 30 in.	Total engine wheel base	40 ft. 7 in.
Drivers, diameter	80 in.	Fuel	Soft coal
Weight on drivers	198,000 lb.	Grate area	81.5 sq. ft.
Weight on front truck	82,000 lb.	Steam pressure	245 lb.
Weight on trailing truck	97,000 lb.	Evaporative heating surface	477 + 3377 = 3854 sq. ft.
Total weight of engine	377,000 lb.	Superheating surface (Type A)	1123 sq. ft.
Weight of tender, loaded	313,100 lb.	Tender capacity	15,800 gal., 26 tons



Canadian Pacific 4-6-4 Type Locomotive for Passenger Service. Class H-1e, Road Nos. 2860-2864. Built by Montreal Locomotive Works, Ltd.

Descriptions: *Railway Mechanical Engineer,* April 1931, May 1939, *Railway Age,* Mar. 28, 1931 & May 6, 1939.

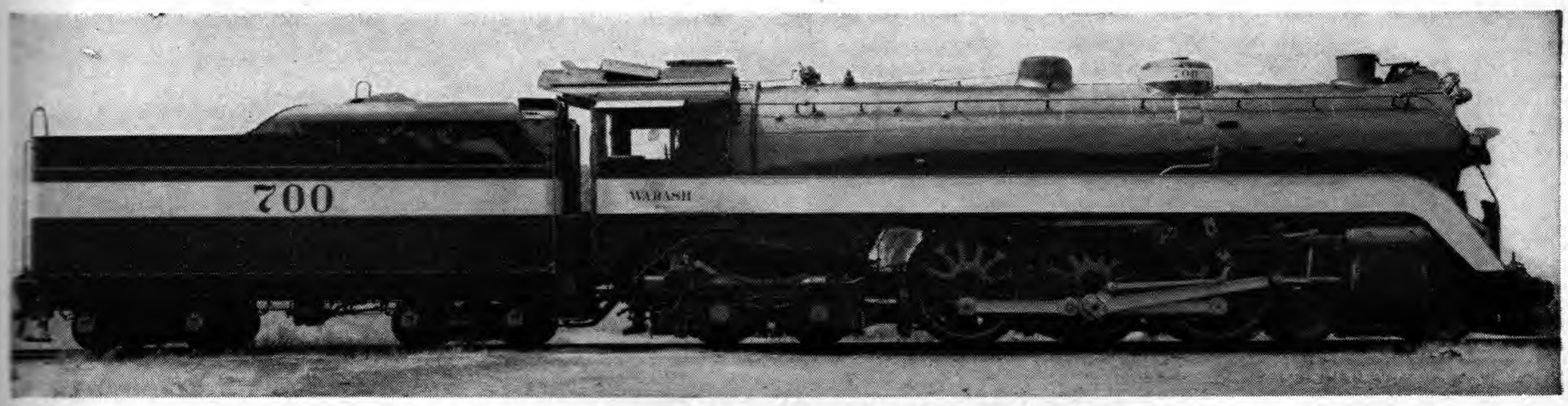
NOTE: Class H-1e are oil-burners, others coal-burners. Data below are for Class H-1d equipped with booster.

Tractive force, engine	45,300 lb.
Tractive force, booster	12,000 lb.
Cylinders, diameter and stroke	22 in. x 30 in.
Drivers, diameter	75 in.
Weight on drivers	185,800 lb.
Weight on front truck	63,900 lb.
Weight on trailing truck	115,700 lb.
Total weight of engine	365,400 lb.
Weight of tender, ⅔ loaded	229,000 lb.
Driving wheel base	13 ft. 2 in.
Total engine wheel base	39 ft. 6 in.
Fuel	Oil
Grate area	80.8 sq. ft.
Steam pressure	275 lb.
Evaporative heating surface	326 + 3,465 = 3,791 sq. ft.
Superheating surface (Type E)	1,542 sq. ft.
Tender capacity	12,000 Imp. gal. water, 4,500 Imp. gal. oil

Chesapeake & Ohio 4-6-4 Type Locomotive, Class L-2, Road Nos. 310-314. Tender Class 21-RJ. Equipped with Franklin Poppet Valves. Built by The Baldwin Locomotive Works.

Description, earlier lot: *Railway Mechanical Engineers,* August, 1942, *Railway Age,* August 29, 1942

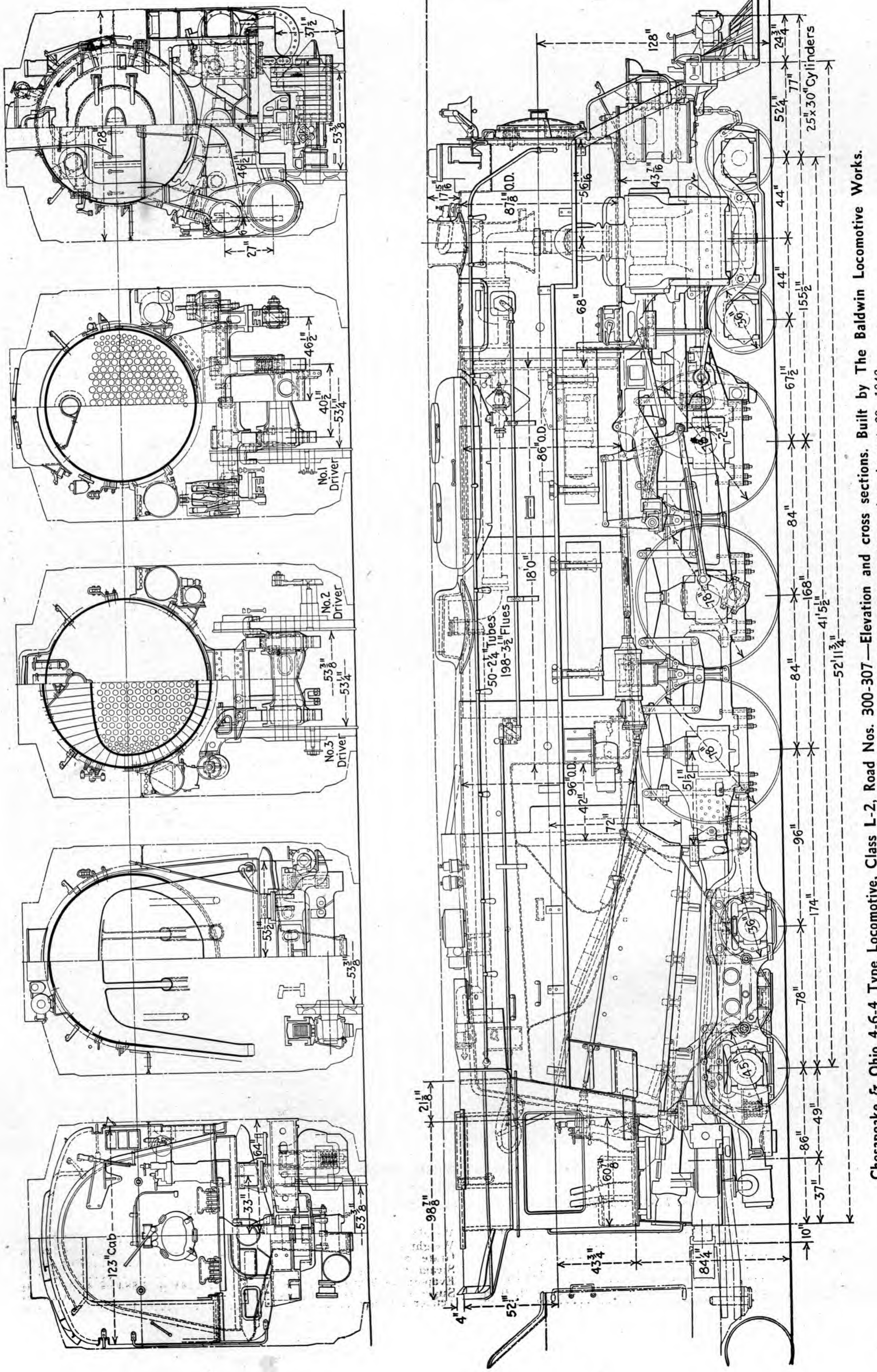
Tractive force, engine	52,100 lb.
Tractive force, booster	14,200 lb.
Cylinders, diameter and stroke	25 in. x 30 in.
Drivers, diameter	78 in.
Weight on drivers	219,500 lb.
Weight on front truck	94,500 lb.
Weight on trailing truck	129,000 lb.
Total weight of engine	443,000 lb.
Weight of tender, ⅔ loaded	317,500 lb.
Driving wheel base	14 ft. 0 in.
Total engine wheel base	41 ft. 5½ in.
Fuel	Bit. coal
Grate area	90.2 sq. ft.
Steam pressure	255 lb.
Evaporative heating surface	405 + 3,773 = 4,178 sq. ft.
Superheating surface (Type E)	1,785 sq. ft.
Tender capacity	21,000 gal., 30 tons



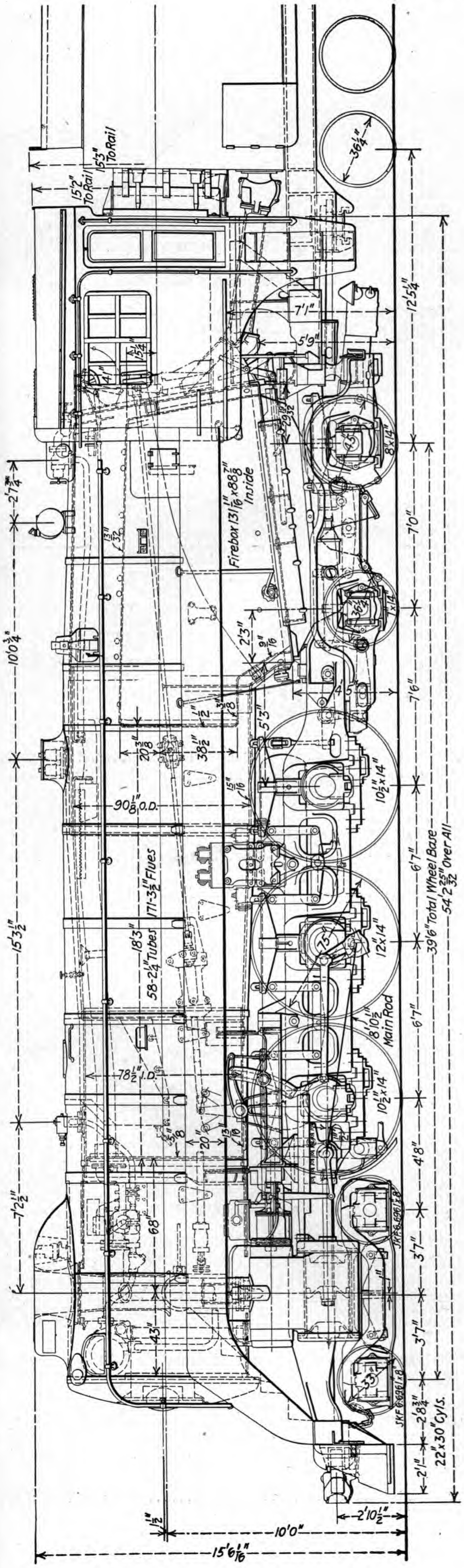
Wabash 4-6-4 Type Locomotive, Class P-1, Road Nos. 700-706. Rebuilt by the road from 2-8-2 Type Locomotives. Class K5.

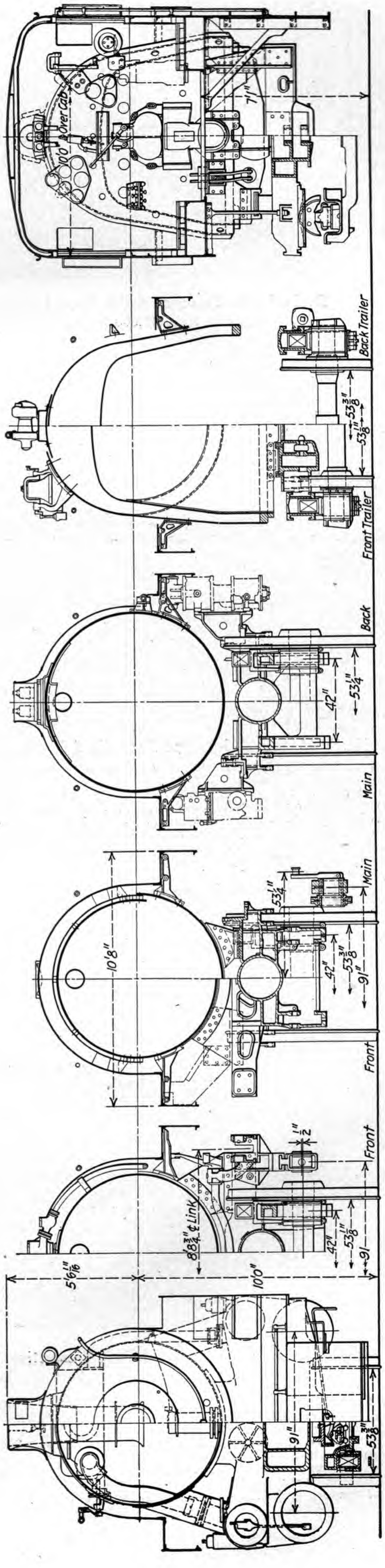
Descriptions: *Railway Mechanical Engineer,* December 1943; *Railway Age,* October 23, 1943

Tractive force	44,244 lb.
Cylinders, diameter and stroke	26 in. x 28 in.
Drivers, diameter	80 in.
Weight on drivers	196,380 lb.
Total weight of engine	374,690 lb.
Driving wheel base	14 ft. 0 in.
Total engine wheel base	40 ft. 7 in.
Weight on front truck	81,710 lb.
Weight on trailing truck	96,580 lb.
Grate area	70.9 sq. ft.
Steam pressure	220 lb.
Evaporative heating surface	341 + 3,884 = 4,225 sq. ft.
Superheating surface (Type A)	1,051 sq. ft.
Tender capacity	12,000 gal., 16 tons



Chesapeake & Ohio 4-6-4 Type Locomotive, Class L-2, Road Nos. 300-307—Elevation and cross sections. Built by The Baldwin Locomotive Works.
Description: *Railway Mechanical Engineer*, August, 1942; *Railway Age*, August 29, 1942

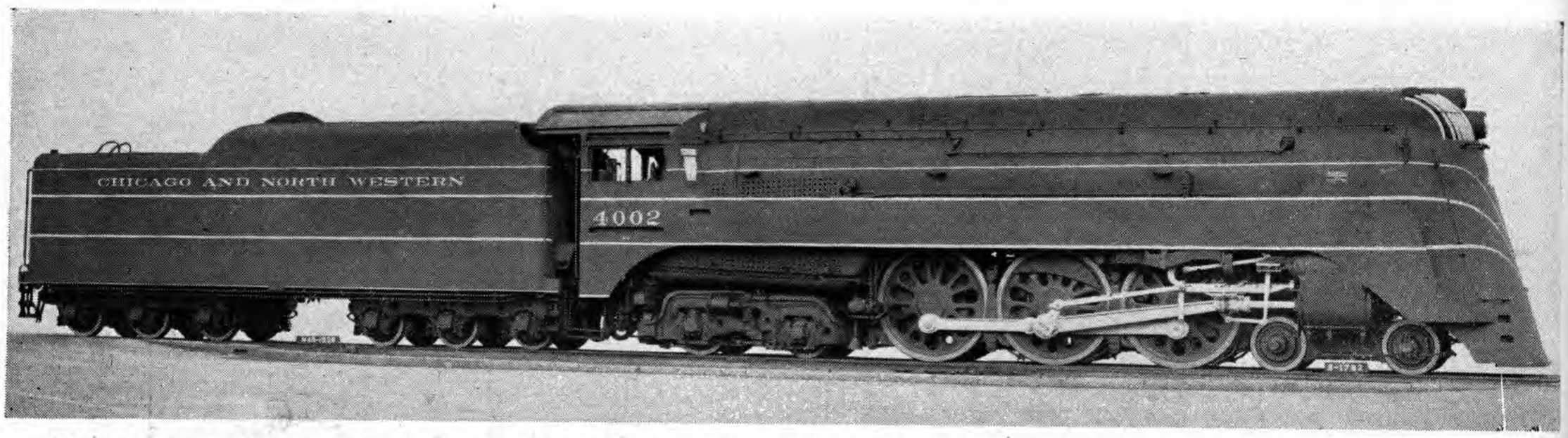




Canadian Pacific 4-6-4 Type Locomotive, Class H-1d, Road Nos. 2850-2859—Elevation and cross sections. Built by Montreal Locomotive Works, Inc.

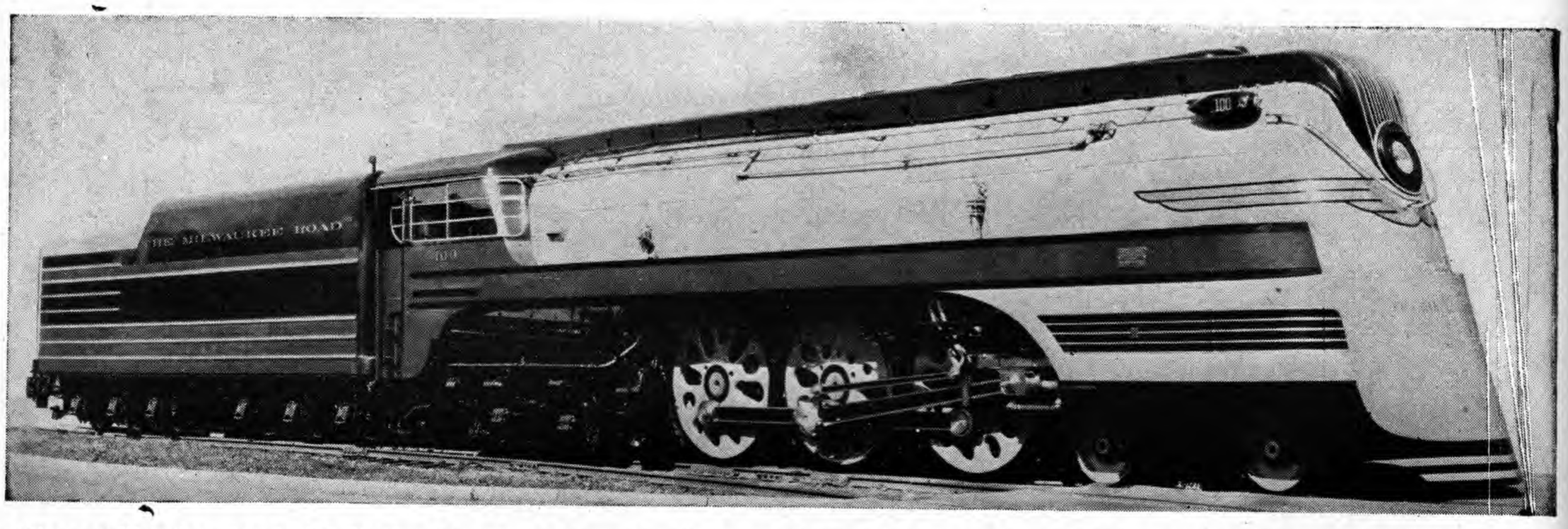
Descriptions: *Railway Mechanical Engineer*, May 1939; *Railway Age*, May 6, 1939

St. Louis-San Francisco 4-6-4 Type Locomotive. Road Nos. 1060-1069. Rebuilt by the road from 4-6-2 Type.
Tractive force 47,800 lb.; cylinders 26 in. by 28 in.; drivers 74 in.; weight of engine 360,960 lb.



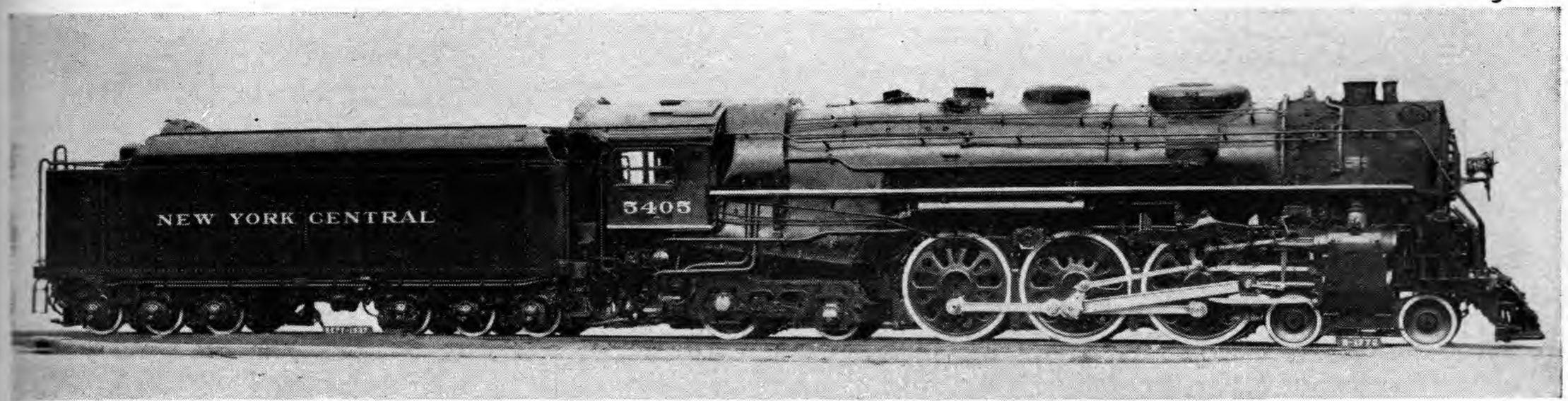
Chicago & North Western 4-6-4 Type Streamlined Locomotive, Class E-4, Road Nos. 4001-4009. Built by the American Locomotive Company
Description: *Railway Mechanical Engineer,* August, 1938; *Railway Age,* August 27, 1938

Tractive force	55,000 lb.	Driving wheel base	14 ft. 8 in.
Cylinders, diameter and stroke	25 in. x 29 in.	Total engine wheel base	42 ft. 4 in.
Drivers, diameter	84 in.	Fuel	Bit. coal
Weight on drivers	216,000 lb.	Grate area	90.7 sq. ft.
Weight on front truck	87,000 lb.	Steam pressure	300 lb.
Weight on trailing truck	109,000 lb.	Evaporative heating surface	507 + 3472 = 3979 sq. ft.
Total weight of engine	412,000 lb.	Superheating surface (Type E)	1884 sq. ft.
Weight of tender, loaded	360,000 lb.	Tender capacity	20,000 gal., 25 tons



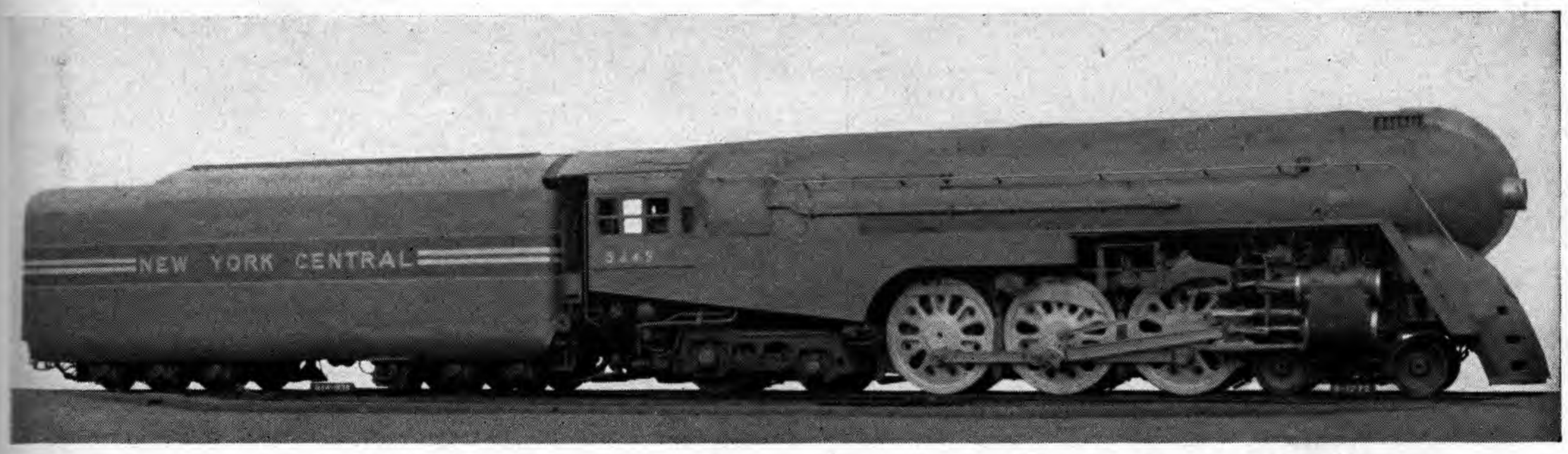
Chicago, Milwaukee, St. Paul & Pacific 4-6-4 Type Locomotive, for heavy Passenger Service. Class F-7. Road Nos. 100-105. Built by the American Locomotive Company.

Tractive force	50,300 lb.	Driving wheel base	14 ft. 8 in.
Cylinders, diameter and stroke	23½ in. x 30 in.	Total engine wheel base	42 ft. 4 in.
Drivers, diameter	84 in.	Fuel	Soft coal
Weight on drivers	216,000 lb.	Grate area	96.5 sq. ft.
Weight on front truck	82,500 lb.	Steam Pressure	300 lb.
Weight on trailing truck	116,500 lb.	Evaporative heating surface	458 + 3708 = 4166 sq. ft.
Total weight of engine	415,000 lb.	Superheating surface (Type E)	1695 sq. ft.
Weight of tender, loaded	375,000 lb.	Tender capacity	20,000 gal., 25 tons



New York Central 4-6-4 (Hudson) Type Locomotive, Class J-3a, Road Nos. 5405-5444. Built by the American Locomotive Company.
Description: *Railway Mechanical Engineer,* May, 1938; *Railway Age,* April 2, 1938.

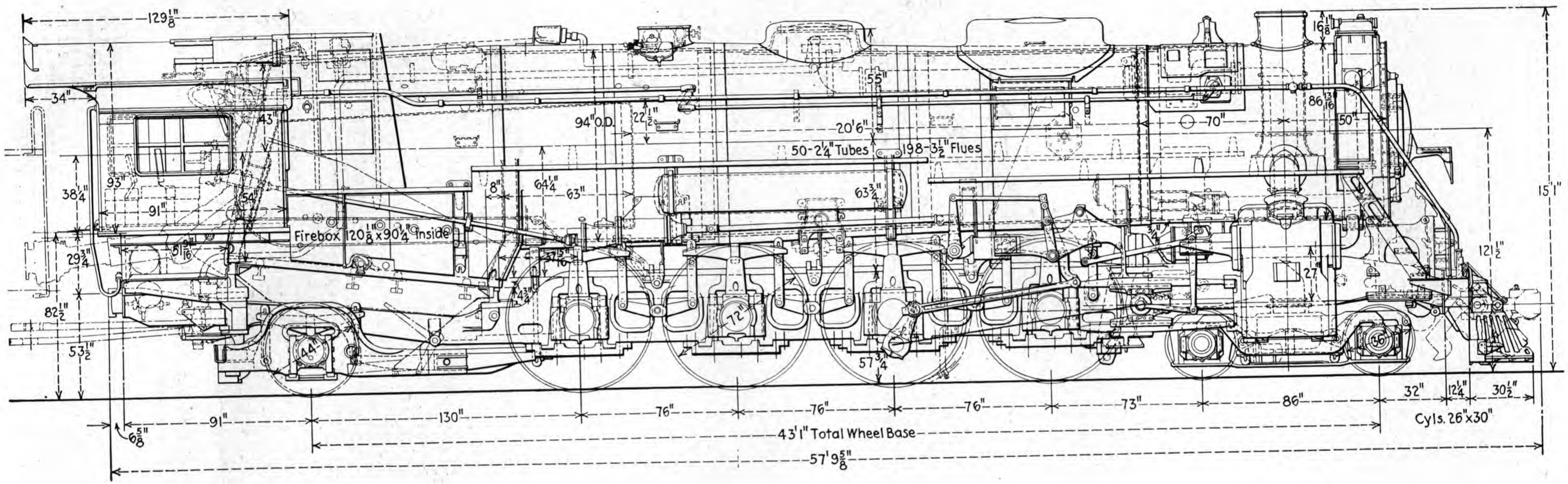
Tractive force, engine	43,440 lb.
Tractive force, booster	12,100 lb.
Cylinders, diameter and stroke	22½ in. x 29 in.
Drivers, diameter	79 in.
Weight on drivers	196,000 lb.
Weight on front truck	66,000 lb.
Weight on trailing truck	98,000 lb.
Total weight of engine	360,000 lb.
Weight of tender, loaded	314,300 lb.
Driving wheel base	14 ft. 0 in.
Total engine wheel base	40 ft. 4 in.
Fuel	Soft coal
Grate area	82 sq. ft.
Boiler diameter	80⅝ in.
Steam pressure	275 lb.
Evaporative heating surface	360 + 3827 = 4187 sq. ft.
Superheating surface (Type E)	1745 sq. ft.
Tender capacity	14,000 gal., 30 tons

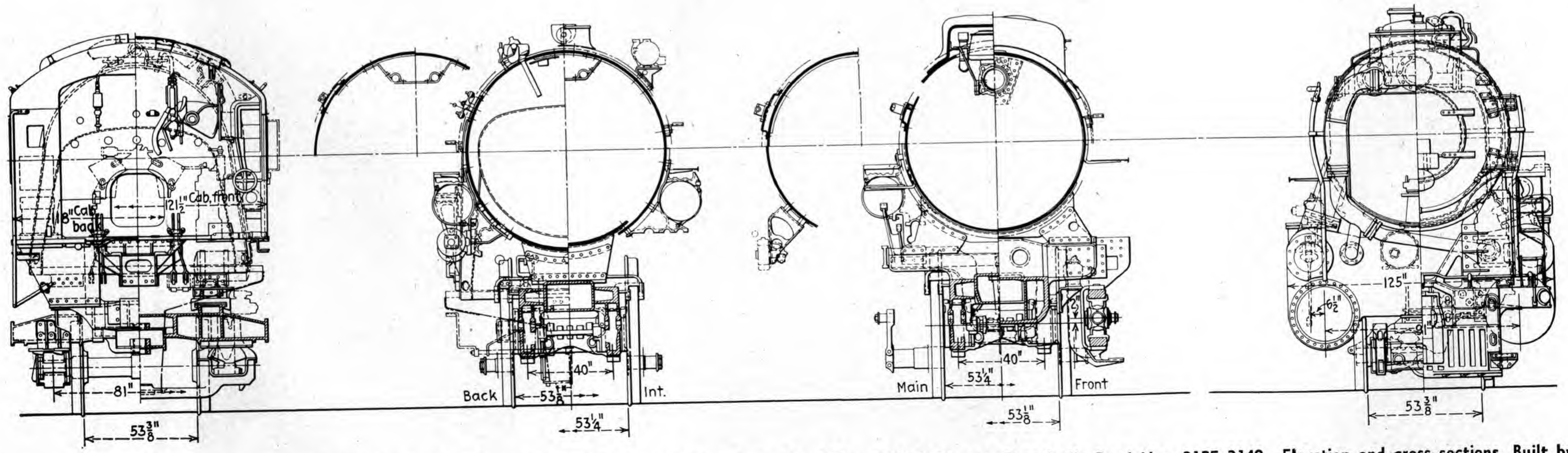


New York Central 4-6-4 (Hudson) Type, Streamlined Locomotive, Class J-3a, Road Nos. 5445-5454.
Locomotive weight, 365,500 lb.—drivers, 201,800 lb.—front truck, 67,100 lb.—trailing truck, 96,600 lb.
Tender weight 316,300 lb.—Capacity 13,600 gal. water; 28 tons coal. Other data same as above.
Description: *Railway Mechanical Engineer,* May, 1938; *Railway Age,* April 2, 1938

New York, New Haven & Hartford 4-6-4 Type Streamlined Locomotive, Class I-5, Road Nos. 1400-1409. Built by the Baldwin Locomotive Works.
Description: *Railway Mechanical Engineer,* May, 1937; *Railway Age,* March 27, 1937

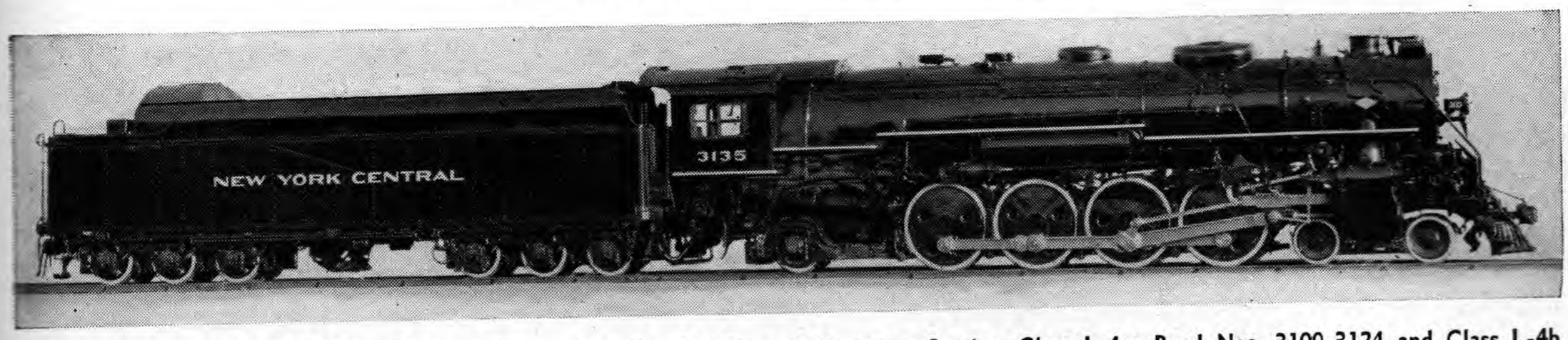
Tractive force	44,000 lb.
Cylinders, diameter and stroke	22 in. x 30 in.
Drivers, diameter	80 in.
Weight on drivers	193,000 lb.
Weight on front truck	71,500 lb.
Weight on trailing truck	100,800 lb.
Total weight of engine	365,300 lb.
Weight of tender, loaded	332,000 lb.
Driving wheel base	14 ft. 0 in.
Total engine wheel base	40 ft. 1 in.
Fuel	Soft coal
Grate area	77.1 sq. ft.
Steam pressure	285 lb.
Evaporative heating surface	480 + 3335 = 3815 sq. ft.
Superheating surface (Type A)	1042 sq. ft.
Tender capacity	18,000 gal., 16 tons





New York Central 4-8-2 (Mohawk) Type Locomotive for Freight and Passenger Service. Class L-4a, Road Nos. 3100-3124 and Class L-4b, Road Nos. 3125-3149—Elevation and cross-sections. Built by the Lima Locomotive Works, Inc.

Description: *Railway Mechanical Engineer,* August, 1943; *Railway Age,* June 26, 1943.



New York Central 4-8-2 (Mohawk) Type Locomotive for Freight and Passenger Service. Class L-4a; Road Nos. 3100-3124 and Class L-4b, Road Nos. 3125-3149. Built by Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

Tractive force	59,900 lb.	Driving wheel base	19 ft. 0 in.
Cylinders, diameter and stroke	26 in. x 30 in.	Total engine wheel base	43 ft. 1 in.
Drivers, diameter	72 in.	Fuel	Soft coal
Weight on drivers	266,500 lb.	Grate area	75.3 sq. ft.
Weight on front truck	74,900 lb.	Steam pressure	250 lb.
Weight on trailing truck	59,700 lb.	Evaporative heating surface	373 + 4,303 = 4,676 sq. ft.
Total weight of engine	401,100 lb.	Superheating surface (Type E)	2,103 sq. ft.
Weight of tender, ⅔ loaded	309,400 lb.	Tender capacity	15,200 gal., 42 tons

Canadian National 4-8-2 (Mountain) Type Locomotive for Fast Passenger Service. Class U-1f; Road Nos. 6060-6079. Built by the Montreal Locomotive Works, Ltd.

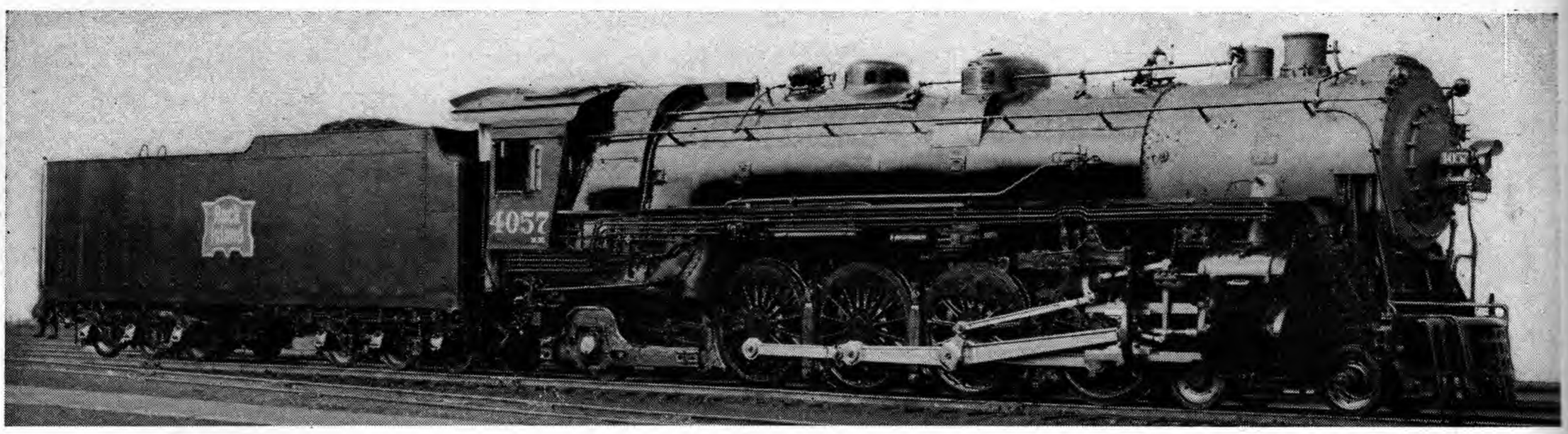
Tractive force	52,500 lb.	Driving wheel base	19 ft. 0 in.
Cylinders, diameter and stroke	24 in. x 30 in.	Total engine wheel base	42 ft. 4 in.
Drivers, diameter	73 lb.	Fuel	Soft coal
Weight on drivers	236,960 lb.	Grate area	70.2 sq. ft.
Weight on front truck	57,740 lb.	Steam pressure	260 lb.
Weight on trailing truck	61,000 lb.	Evaporative heating surface	386 + 3198 = 3584 sq. ft.
Total weight of engine	355,700 lb.	Superheating surface (Type A)	1570 sq. ft.
Weight of tender, loaded	281,840 lb.	Tender capacity	11,700 Imp. gal., 18 tons

Lehigh & Hudson River 4-8-2 (Mountain) Type Locomotive For Freight Service. Road Nos. 10-12. Built by The Baldwin Locomotive Works.

Description: *Railway Age*, August 12, 1944)

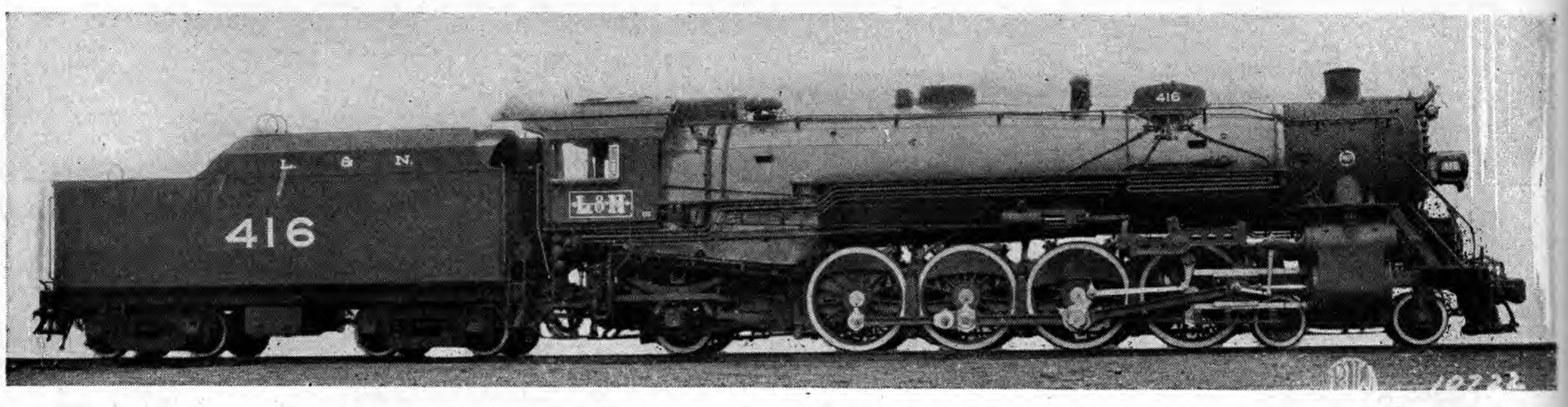
Tractive force	67,000 lb.	Driving wheel base	19 ft. 3 in.
Cylinders, diameter and stroke	28 in. x 31 in.	Total engine wheel base	44 ft. 2 in.
Drivers, diameter	73 in.	Fuel	Soft coal
Weight on drivers	269,116 lb.	Grate area	79 sq. ft.
Weight on front truck	79,627 lb.	Steam pressure	240 lb.
Weight on trailing truck	66,457 lb.	Evaporative heating surface	475 + 4036 = 4511 sq. ft.
Total weight of engine	415,200 lb.	Superheating surface (Type E)	1887 sq. ft.
Weight of tender, ⅔ loaded	320,600 lb.	Tender capacity	23,000 gal., 21 tons

Note: Same design as Boston & Maine, *Railway Mechanical Engineer*, Oct. 1935; *Railway Age*, Aug. 17, 1935



Chicago, Rock Island & Pacific 4-8-2 (Mountain) Type Locomotive for Passenger Service. Class M-50a; Road Nos. 4044-4061. Built by the American Locomotive Company and modernized by railway company.

Tractive force, engine	47,832 lb.	Driving wheel base	19 ft. 10 in.
Cylinders, diameter and stroke	26 in. x 28 in.	Total engine wheel base	42 ft. 1 in.
Drivers, diameter	74 in.	Fuel	Soft coal
Weight on drivers	253,500 lb.	Grate area	63 sq. ft.
Weight on front truck	65,800 lb.	Steam pressure	220 lb.
Weight on trailing truck	59,200 lb.	Evaporative heating surface	4,437 sq. ft.
Total weight of engine	378,500 lb.	Superheating surface (Type A)	1,276 sq. ft.
Weight of tender, loaded	343,500 lb.	Tender capacity	20,000 gal

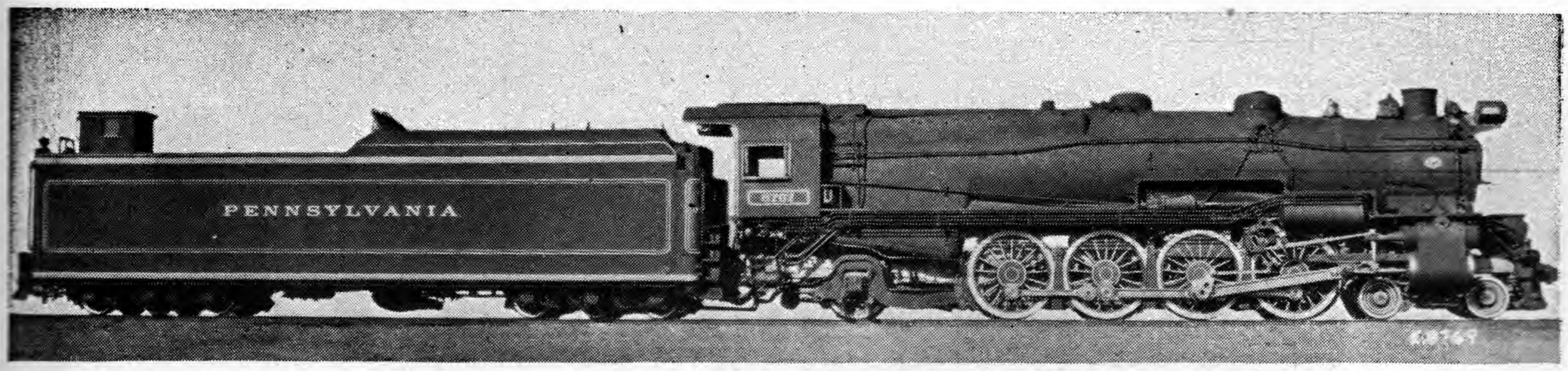


Louisville & Nashville 4-8-2 (Mountain) Type Locomotive for Passenger Service. Class L-1; Road Nos. 416-421. Built by The Baldwin Locomotive Works.

Tractive force	55,860 lb.	Driving wheel base	18 ft. 3 in.
Cylinders, diameter and stroke	27 in. x 30 in.	Total engine wheel base	40 ft. 0 in.
Drivers, diameter	70 in.	Fuel	Soft coal
Weight on drivers	226,910 lb.	Grate area	70.8 sq. ft.
Weight on front truck	57,280 lb.	Steam pressure	210 lb.
Weight on trailing truck	53,540 lb.	Evaporative heating surface	415 + 3608 = 4023 sq. ft.
Total weight of engine	337,730 lb.	Superheating surface (Type A)	1087 sq. ft.
Weight of tender, loaded	196,000 lb.	Tender capacity	10,000 gal., 19 tons

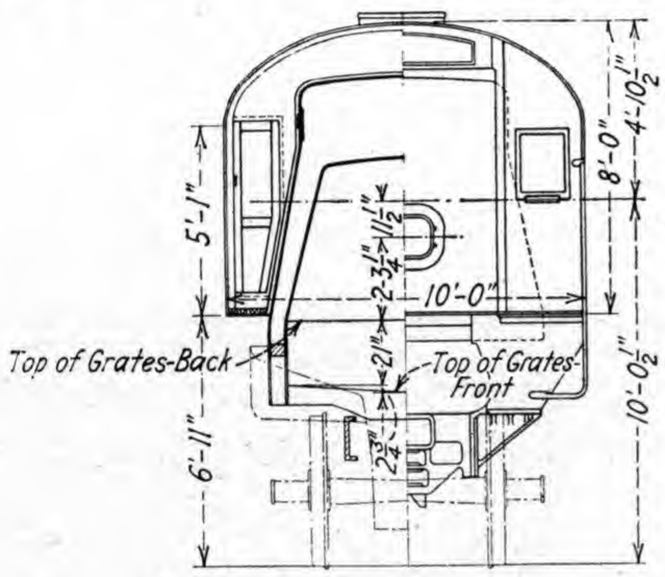
St. Louis-San Francisco 4-8-2 (Mountain) Type Locomotive; Road Nos. 4400-4422. Built by S. L.-S. F. Shops.

Tractive force	68,600 lb.	Driving wheel base	18 ft. 3 in.
Cylinders, diameter and stroke	29 in. x 32 in.	Total engine wheel base	42 ft. 6 in.
Drivers, diameter	70 in.	Fuel	Oil
Weight on drivers	278,950 lb.	Grate area	76,2 sq. ft.
Weight on front truck	75,180 lb.	Steam pressure	210 lb.
Weight on trailing truck	65,070 lb.	Evaporative heating surface	410 + 4712 = 5122 sq. ft.
Total weight of engine	419,200 lb.	Superheating surface (Coffin C-S)	1726 sq. ft.
Weight of tender, loaded	255,890 lb.	Tender capacity	14,000 gal. water; 5,000 gal. oil



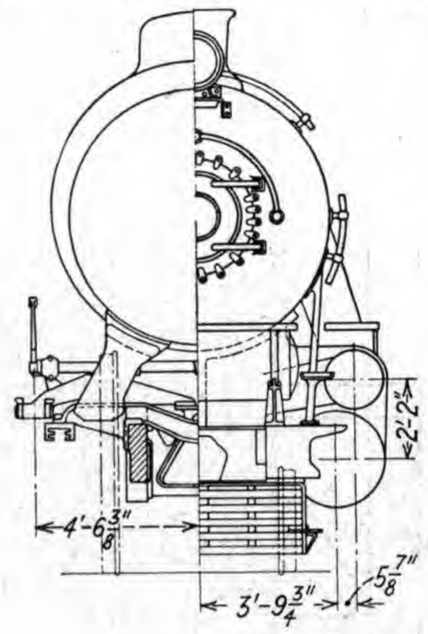
Pennsylvania Railroad 4-8-2 (Mountain) Type Locomotive, Class M-1a, for Fast Freight Service. Equipped with Belpaire Boiler and large Tender (210-F-75)

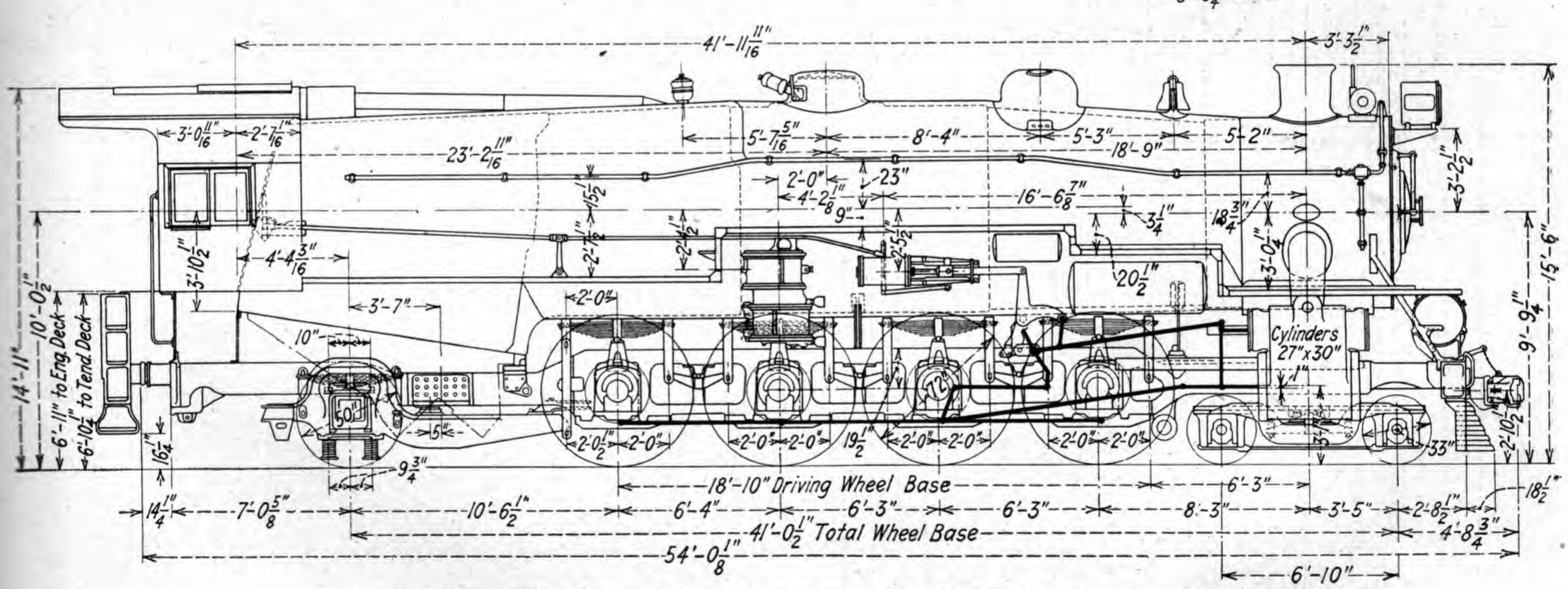
Tractive force	64,550 lb.
Cylinders, diameter and stroke	27 in. x 30 in.
Drivers, diameter	72 in.
Weight on drivers	271,000 lb.
Weight on front truck	59,000 lb.
Weight on trailing truck	60,000 lb.
Total weight of engine	390,000 lb.
Weight of tender, loaded	378,360 lb.
Driving wheel base	18 ft. 10 in.
Total engine wheel base	41 ft. 9½ in.
Fuel	Soft coal
Grate area	69.9 sq. ft.
Steam pressure	250 lb.
Evaporative heating surface	395 + 4307 = 4702 sq. ft.
Superheating Surface (Type E)	1634 sq. ft.
Tender capacity	22,090 gal.—31½ tons



NOTE

Deck has been lowered to 6 ft. 4 in.; stoker added and air pump transferred to the left side since drawing was made.

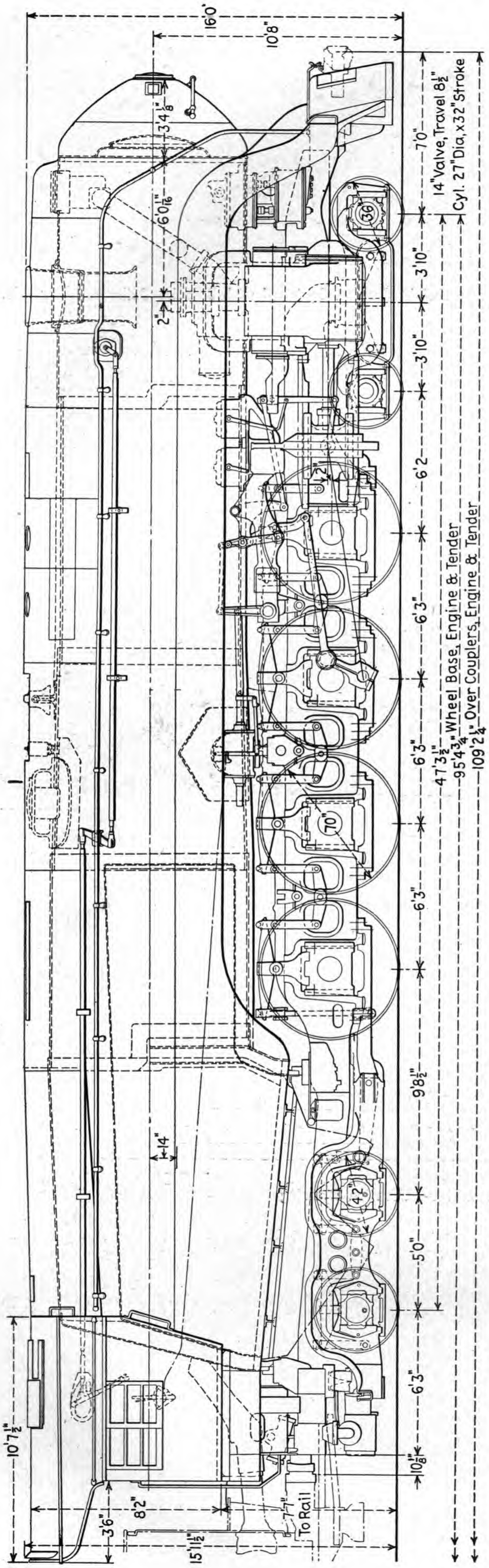


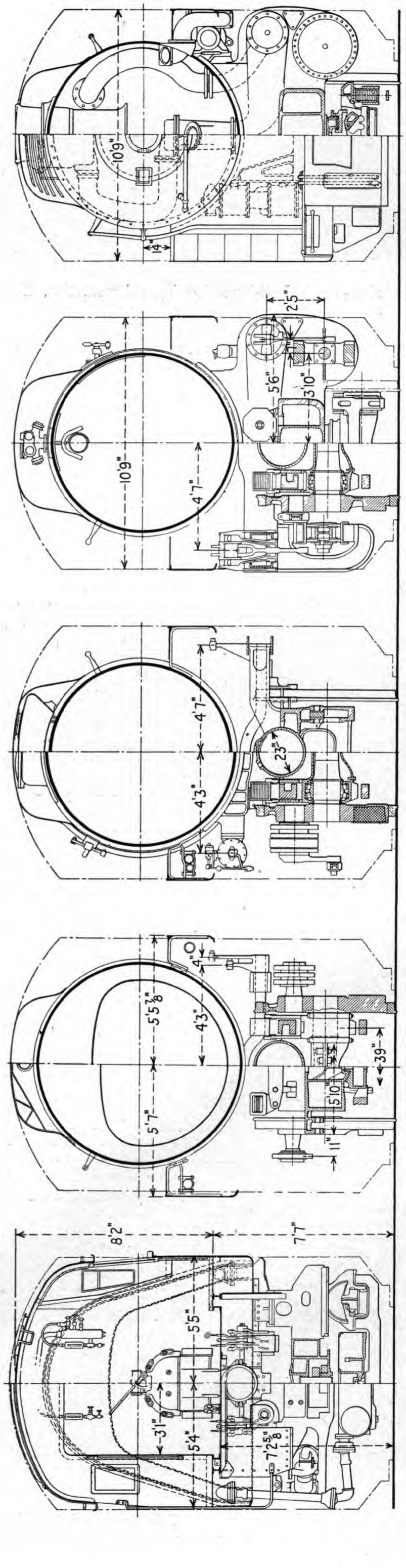


Pennsylvania Railroad Class M-1 Locomotive—Elevation Drawing

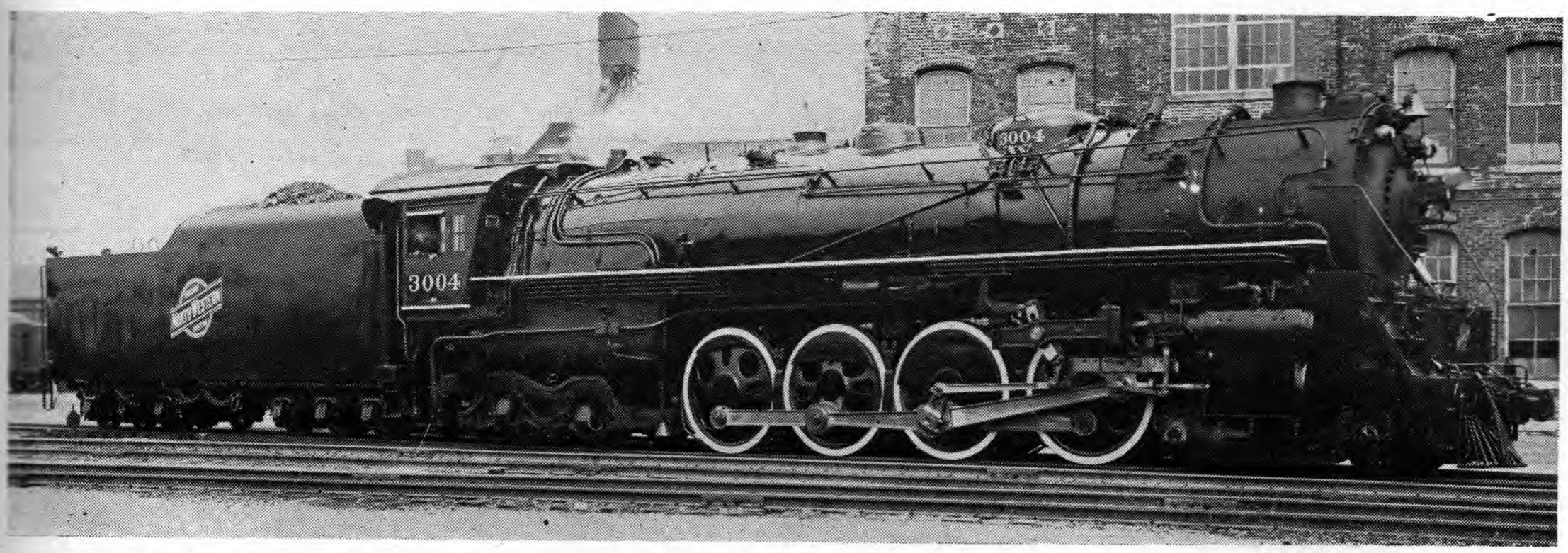
Pennsylvania Railroad Class M-1 Locomotive as originally built.

Weight of locomotive, 385,000 lb.; tender capacity, 11,000 gal. water and 35,000 lb. coal





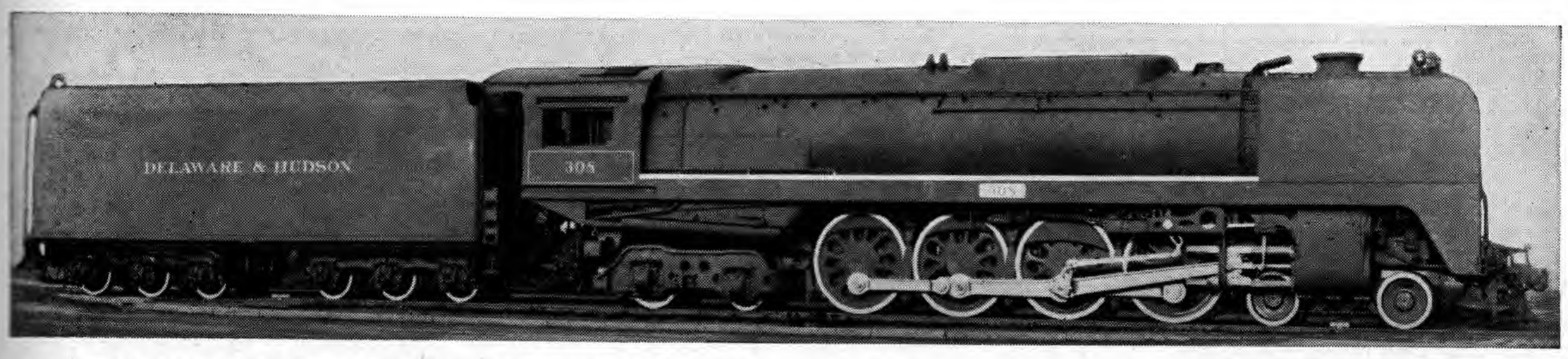
Norfolk & Western 4-8-4 Type Locomotive, Class J, Road Nos. 600-610. Elevation and cross-sections. Built by the N. & W. Roanoke Shops.
(See also opposite page)



Chicago & North Western 4-8-4 Type Locomotive, Class H-1, Road Nos. 3001-3035. Built by The Baldwin Locomotive Works in 1929; Reconstructed by C. & N. W. in 1946.

Descriptions: *Railway Mechanical Engineer,* June 1946; *Railway Age,* April 27, 1946.

Tractive force, engine	71,800 lb.	Drivers, diameter	76 in.
Tractive force, booster	12,400 lb.	Steam pressure	275 lb.
Cylinders, diameter and stroke	27 in. x 32 in.	Weight of engine, original	498,000 lb.



Delaware & Hudson 4-8-4 Type Locomotive, Class K-62, for fast freight service. Road Nos. 300-314. Built by the American Locomotive Company.

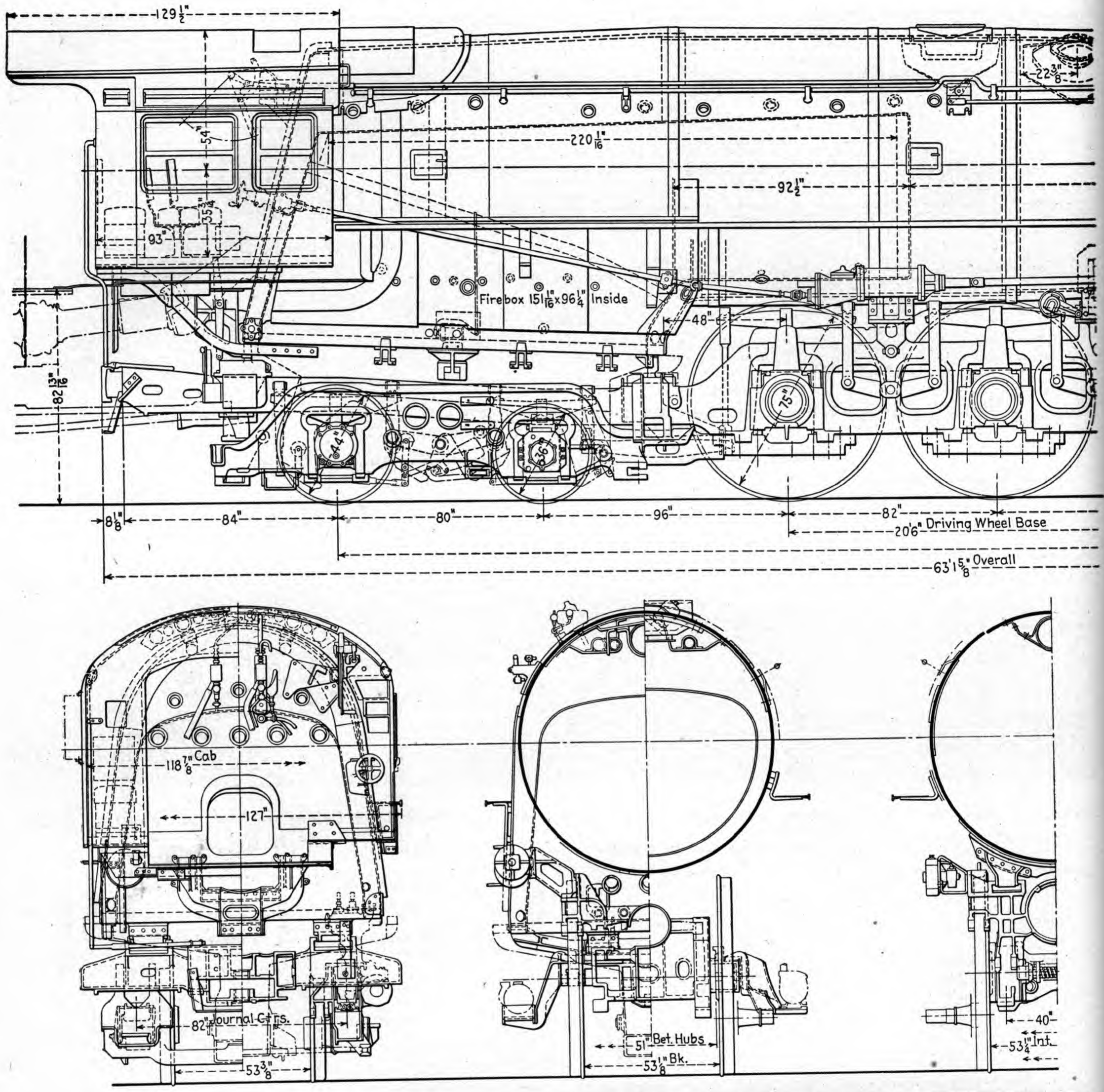
Description: *Railway Mechanical Engineer,* September, 1943; *Railway Age,* July 17, 1943.

Tractive force	62,040 lb.	Driving wheel base	19 ft. 9 in.
Cylinders, diameter and stroke	24½ in. x 32 in.	Total engine wheel base	47 ft. 1 in.
Drivers, diameter	75 in.	Fuel	Soft coal
Weight on drivers	270,000 lb.	Grate area	96.2 sq. ft.
Weight on front truck	92,500 lb.	Steam pressure	285 lb.
Weight on trailing truck	107,500 lb.	Evaporative heating surface	482 + 3,995 = 4,477 sq. ft.
Total weight of engine	470,000 lb.	Superheating surface (Type A)	1,473 sq. ft.
Weight of tender, ⅔ loaded	298,000 lb.	Tender capacity	20,000 gal., 25 tons

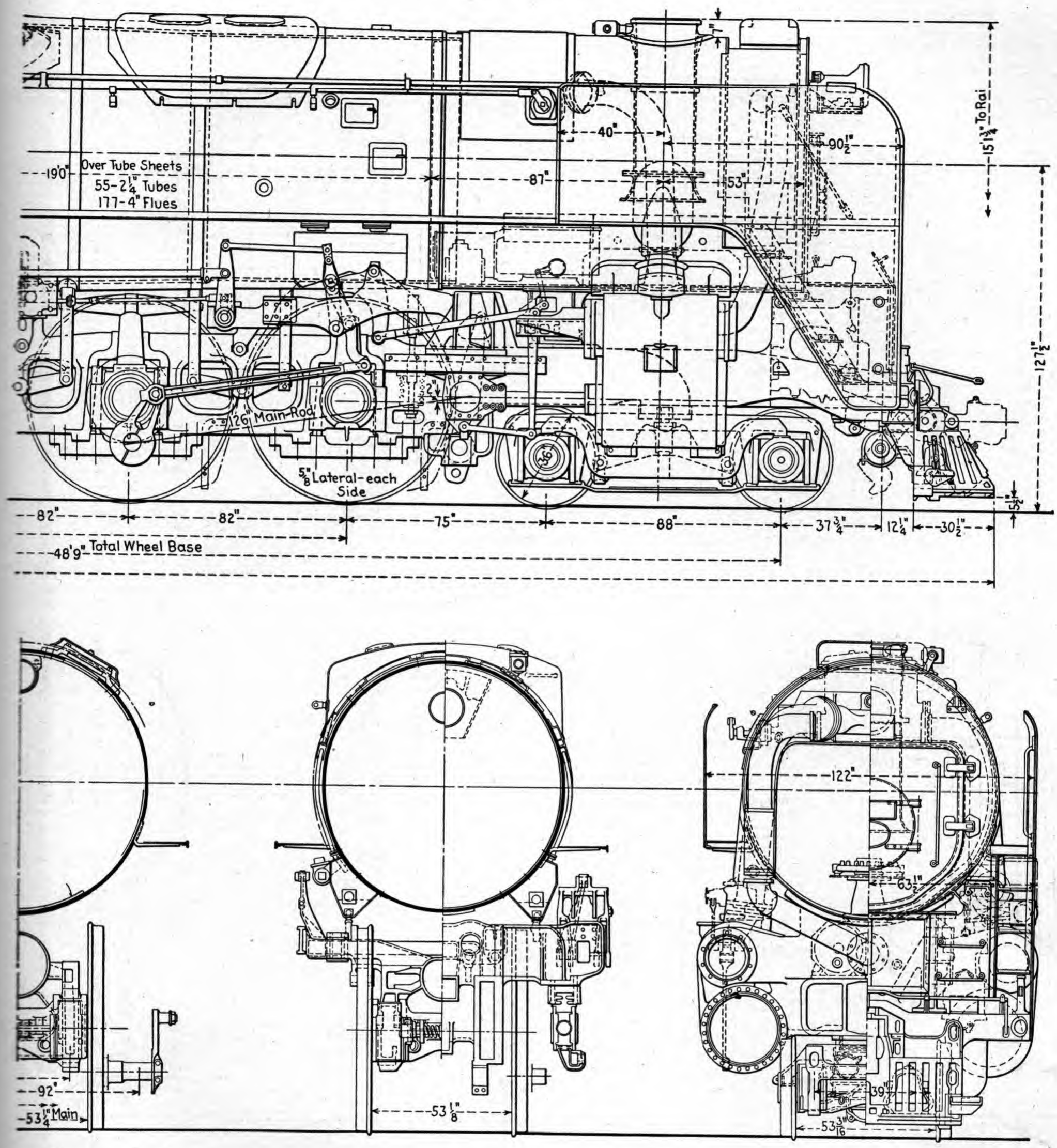
Norfolk & Western 4-8-4 Type Locomotive, streamlined, for passenger service. Class J; Road Nos. 600-610. Built by the Norfolk & Western, Roanoke Shops.

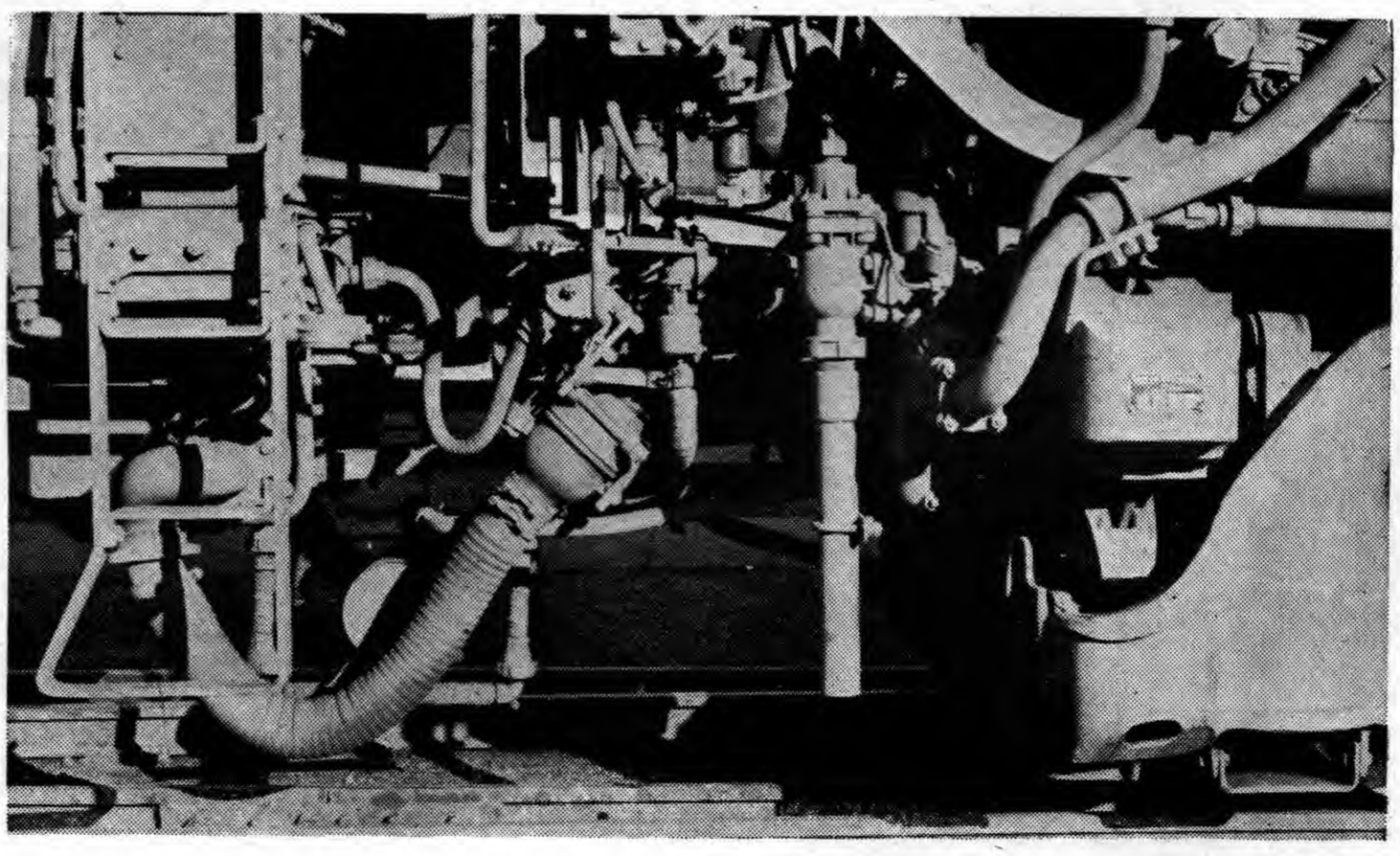
Descriptions: *Railway Mechanical Engineer,* June 1945; *Railway Age,* June 2, 1945
(*For Drawing see opposite page*)

Tractive force	80,000 lb.	Driving wheel base	18 ft. 9 in.
Cylinders, diameter and stroke	27 in. x 32 in.	Total engine wheel base	47 ft. 3½ in.
Drivers, diameter	70 in.	Fuel	Soft coal
Weight on drivers	288,000 lb.	Grate area	107.7 sq. ft.
Weight on front truck	101,600 lb.	Steam pressure	300 lb.
Weight on trailing truck	104,400 lb.	Evaporative heating surface	5,271 sq. ft.
Total weight of engine	494,000 lb.	Superheating surface (Type F)	2,177 sq. ft.
Weight of tender, loaded	378,600 lb.	Tender capacity	20,000 gal., 35 tons


129 1/2"
54"
35 3/4"
93"
82 13/16"
Firebox 151 1/16" x 96 1/4" Inside
220 1/16"
92 1/2"
22 3/8"
48"
75"
44"
36"
8 1/8"
84"
80"
96"
82"
20'6" Driving Wheel Base
63'1 5/8" Overall
118 7/8" Cab
127"
82" Journal Ctrs.
53 3/8"
51" Bet. Hubs
53 1/8" Bk.
40"
53 1/4" Int.

5000





New York Central 4-8-4 (Niagara) Type Locomotive, Class S-1

Builder, the American Locomotive Company

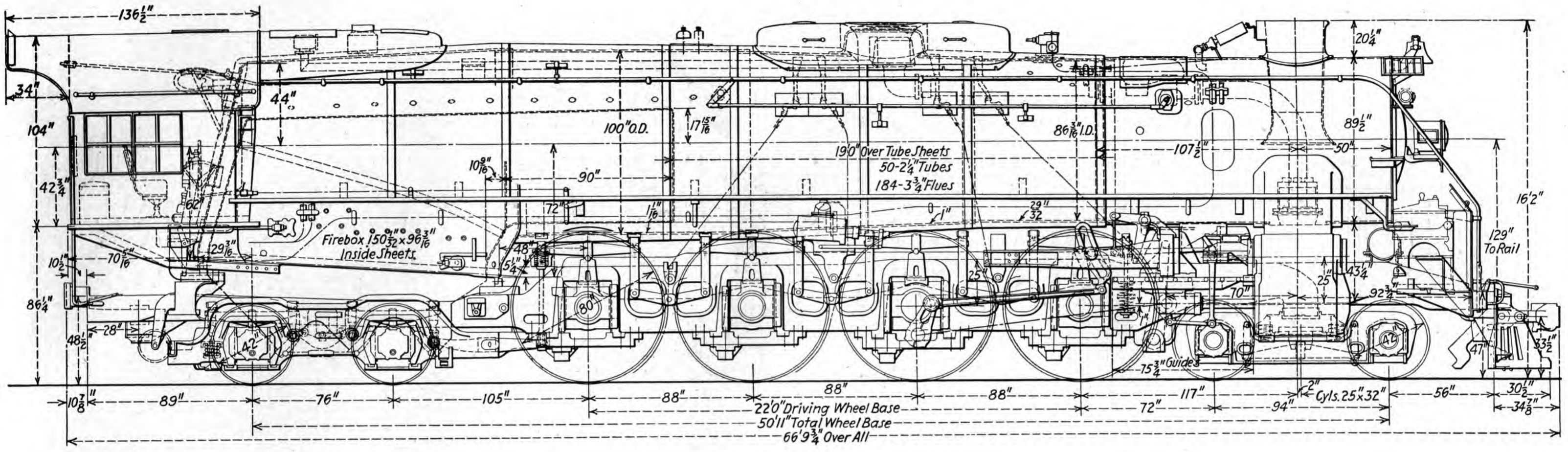
(Above) Elevation and cross-sections.

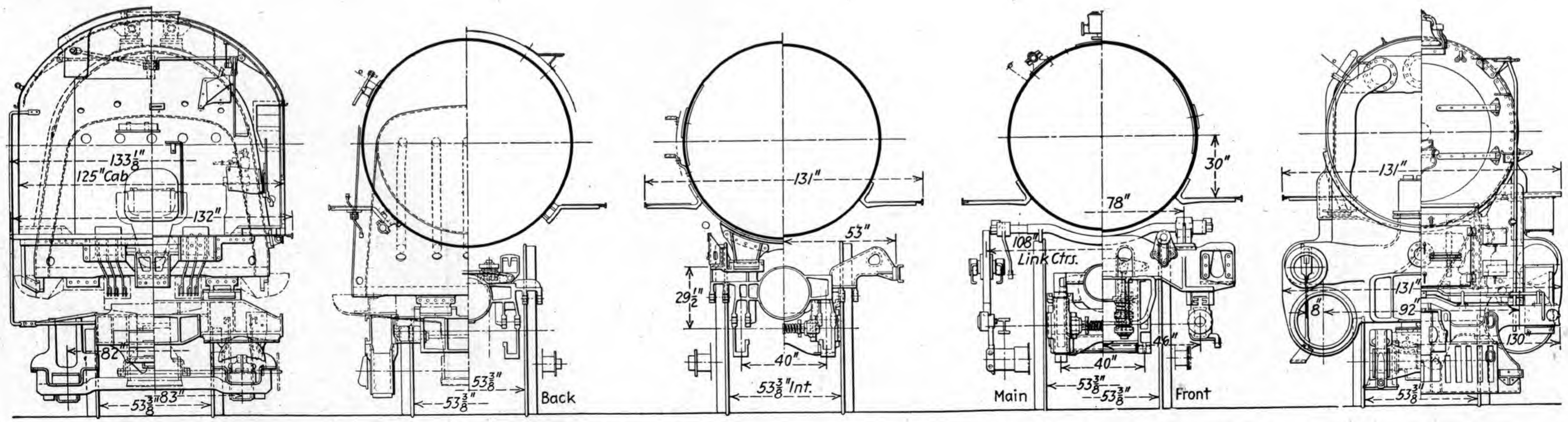
(Left) Left-hand side of locomotive showing firebox and cab support.

(Left) Connection between locomotive and tender, right side.

(Right) Connection between locomotive and tender, right side.

Description: *Railway Mechanical Engineer,* October, 1945; *Railway Age,* Sept. 22, 1945.





Union Pacific 4-8-4 Type Locomotive, Road Nos. 820-834—Elevation and cross-sections. Built by American Locomotive Company.

Description: ***Railway Mechanical Engineer,*** November, 1939; ***Railway Age,*** October 7, 1939

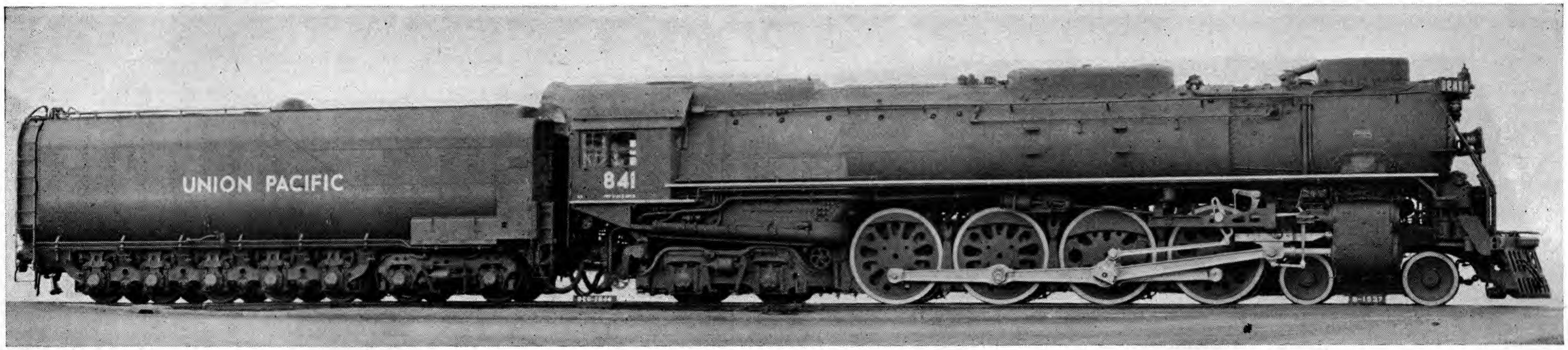
(See opposite page for later order.)

Note: For previous lot, Road Nos. 800-819, see ***Railway Mechanical Engineer,*** February, 1938, and 1938 ***Locomotive Cyclopedia,*** pages 237, 239 and Fig. 227

New York Central 4-8-4 Type Locomotive, Class S-1a for passenger service. Road Nos. 6001-6025. Built by the American Locomotive Company.

Tractive force	61,500 lb.	Total weight of engine	471,000 lb.	Fuel	Soft coal
Cylinders, diameter and stroke	25½ in. x 32 in.	Weight of tender, ⅔ loaded	377,400 lb.	Grate area	101 sq. ft.
Drivers, diameter	79 in.	Wriving wheel basc	20 ft. 6 in.	Steam pressure	275 lb.
Weight on drivers	275,000 lb.	Total engine wheel base	48 ft. 5 in.	Evaporative heating surface	499 + 4,320 = 4,819 sq. ft.
Weight on front truck	91,400 lb.	Boiler diameter	90 in.	Superheating surface (Type E)	2,073 sq. ft.
Weight on trailing truck	104,600 lb.	Firebox, length and with	151 1/16 x 96¼ in.	Tender capacity	18,000 gal., 46 tons

Descriptions: *Railway Mechanical Engineer,* October 1945; *Railway Age, September* 22, 1945.

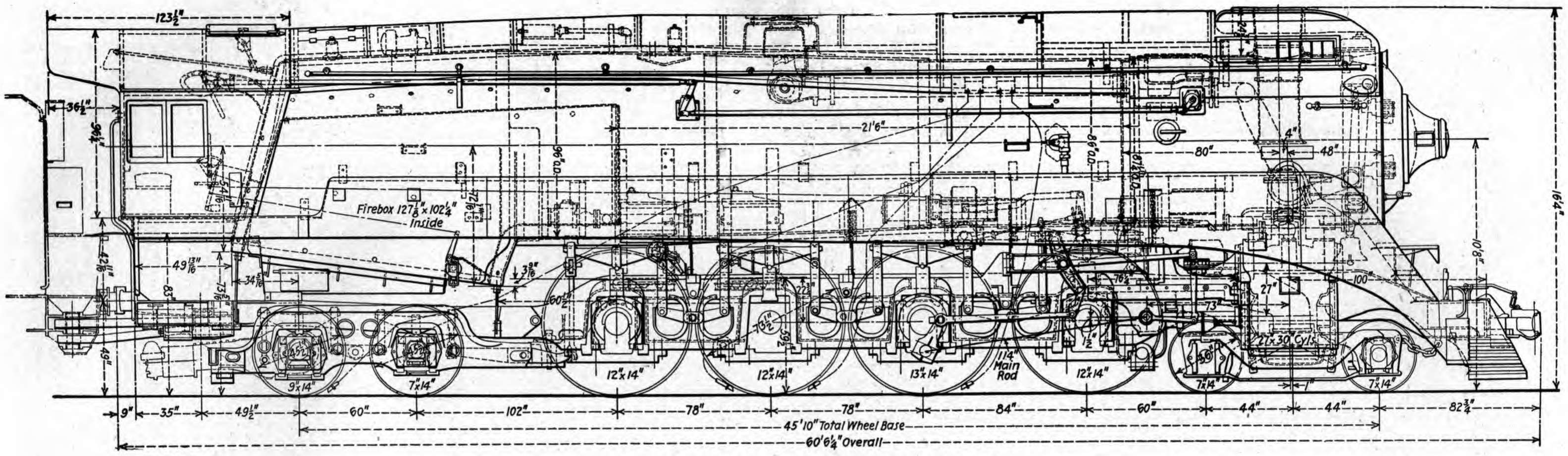


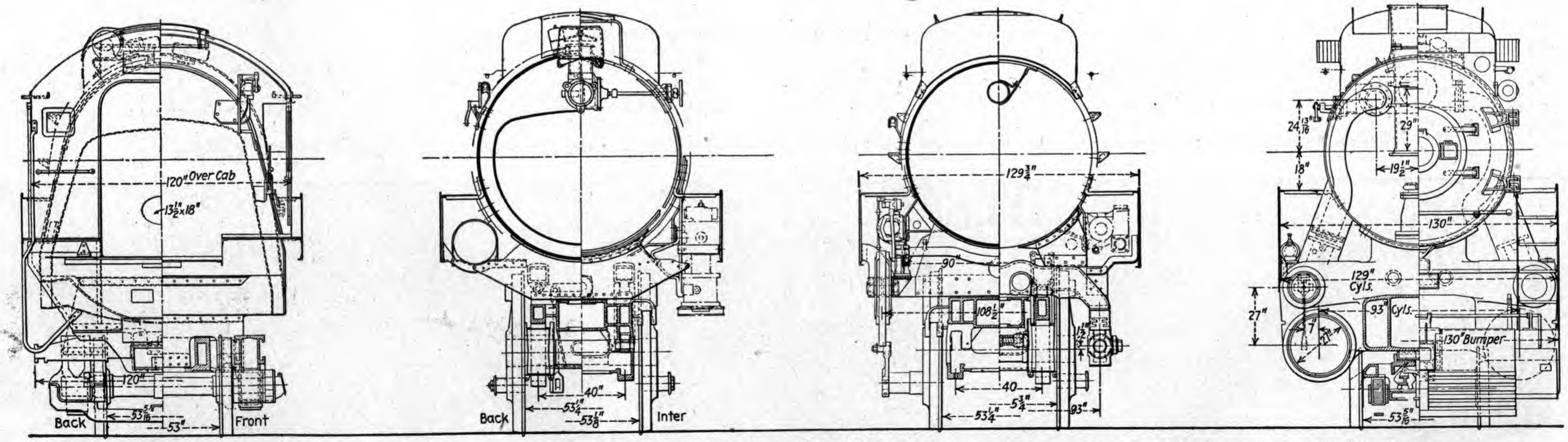
Union Pacific 4-8-4 Type Locomotive, Class FEF-3, for passenger and fast freight service. Road Nos. 835-844. Built by the American Locomotive Company.

Tractive force, engine	63,800 lb.	Total weight of engine	490,700 lb.	Grate area	100.2 sq. ft.
Cylinders, diameter and stroke	25 in. x 32 in.	Weight of tender, loaded	411,400 lb.	Steam pressure	300 lb.
Drivers, diameter	80 in.	Driving wheel base	22 ft. 0 in.	Evaporative heating surface	512 + 3,782 = 4,294 sq. ft.
Weight on drivers	270,300 lb.	Total engine wheel base	50 ft. 11 in.	Superheating surface (Type A)	1,400 sq. ft.
Weight cn front truck	100,600 lb.	Fuel	Soft coal	Tender capacity	23,500 gal., 25 tons
Weight on trailing truck	119,800 lb.	Firebox, length and width	150 in. x 96¼ in.		

Description, Nos. 820-834; *Railway Mechanical Engineer,* November 1939; *Railway Age,* October 7, 1939.

(*See opposite page*)

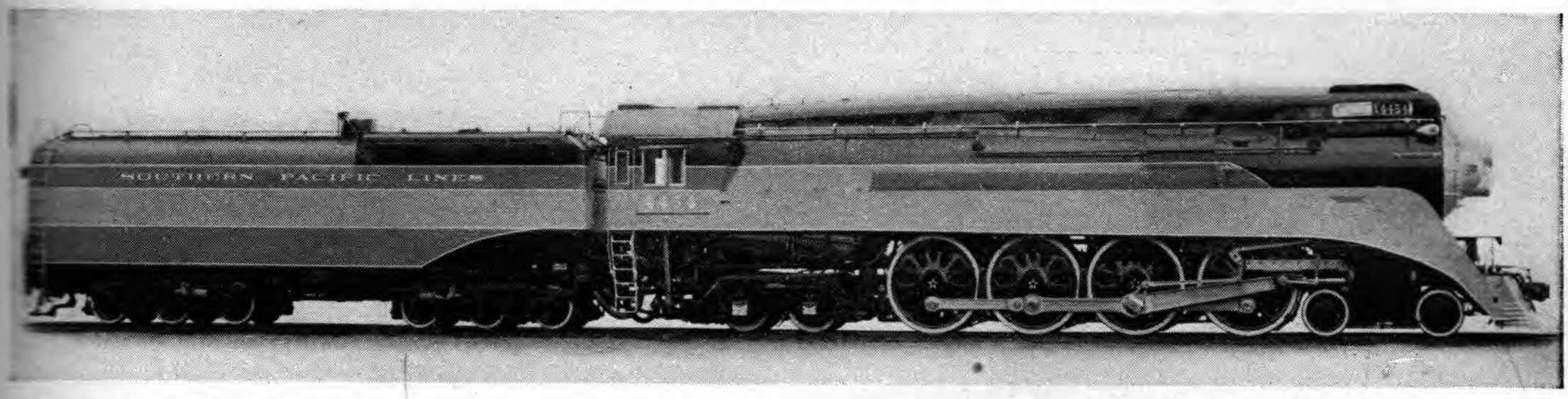




Southern Pacific 4-8-4 Type Streamlined Locomotive. Class GS-2, Road Nos. 4410-4415—Elevation and cross-section. Built by Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

Description, Class GS-2: *Railway Mechanical Engineer,* March, 1937; *Railway Age,* February 20, 1937
Description, Class GS-3; *Railway Mechanical Engineer,* July, 1938; *Railway Age,* June 25, 1938

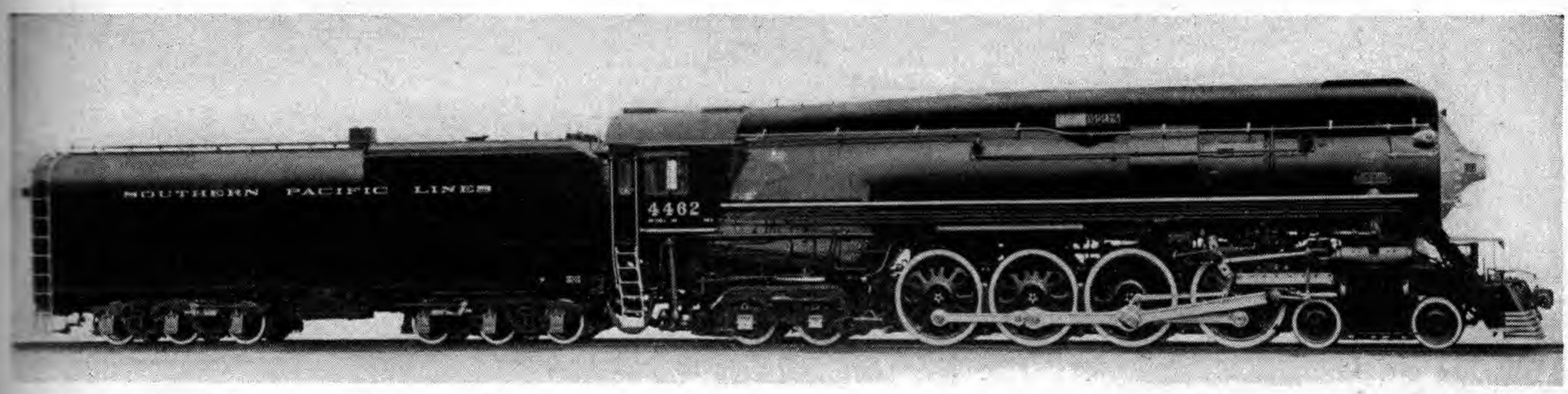
(See opposite page)



Southern Pacific 4-8-4 Type Locomotive for passenger service. Class GS-4, Road Nos. 4430-4457. Built by Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

(For drawing of Class GS-2 see opposite page)

Tractive force, engine	64,760 lb.
Tractive force, booster	13,000 lb.
Cylinders, diameter and stroke	25½ in. x 32 in.
Drivers, diameter	80 in.
Weight on drivers	275,700 lb.
Weight on front truck	81,300 lb.
Weight on trailing truck	118,000 lb.
Total weight of engine	475,000 lb.
Weight of tender, ⅔ loaded	313,750 lb.
Driving wheel base	21 ft. 6 in.
Total engine wheel base	47 ft. 8 in.
Fuel	Oil
Grate area	90.4 sq. ft.
Steam pressure	300 lb.
Evaporative heating surface	385 + 3,585 = 4,887 sq. ft.
Superheating surface (Type E)	2,086 sq. ft.
Tender capacity	23,300 gal. water, 5,880 gal. oil



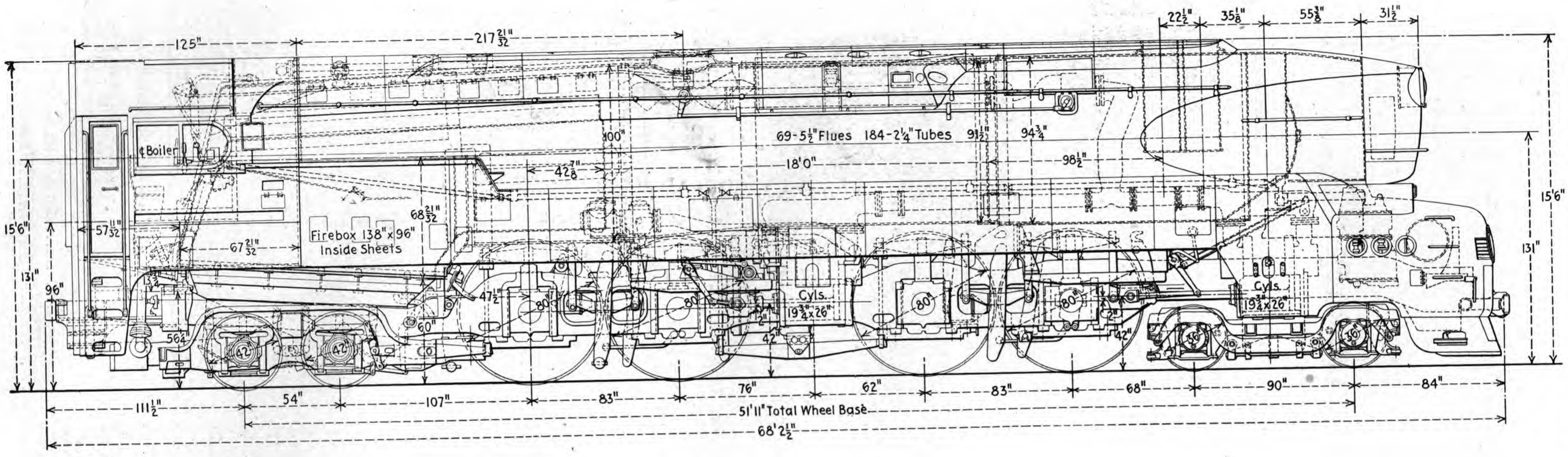
Southern Pacific 4-8-4 Type Locomotive for freight service. Class GS-6, Road Nos. 4460-4463. Built by Lima Locomotive Works, Inc., Division of Lima-Hamilton Corp.

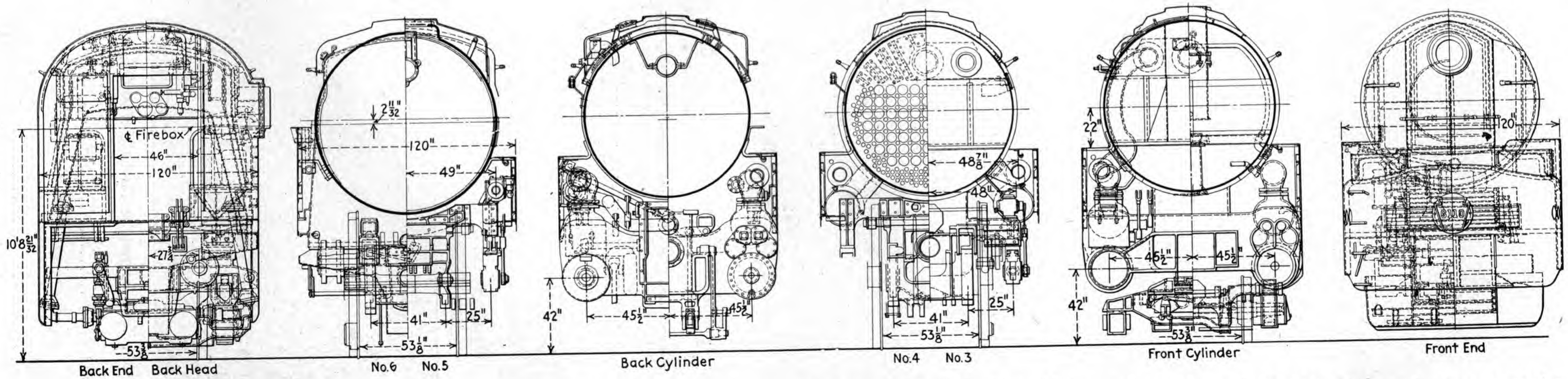
Description, Class GS-2: *Railway Mechanical Engineer,* March, 1937; *Railway Age,* February 20, 193?
Description, Class GS-3: *Railway Mechanical Engineer,* July, 1938; *Railway Age,* June 25, 1938

Tractive force, engine	64,200 lb.
Tractive force, booster	11,300 lb.
Cylinders, diameter and stroke	27 in. x 30 in.
Drivers, diameter	73½ in.
Weight on drivers	283,200 lb.
Weight on front truck	72,700 lb.
Weight on trailing truck	112,500 lb.
Total weight of engine	468,400 lb.
Weight of tender, ⅔ loaded	317,800 lb.
Driving wheel base	20 ft. 0 in.
Total engine wheel base	45 ft. 10 in.
Fuel	Oil
Grate area	90.2 sq. ft.
Boiler diameter, O. D.	86 in.
Steam pressure	260 lb.
Evaporative heating surface	350 + 4,502 = 4,852 sq. ft.
Superheating surface (Type E)	2,086 sq. ft.
Tender capacity	23,200 gal. water, 6,080 gal. oil

Western Maryland 4-8-4 Type Locomotive for freight service. Class J-1, Road Nos. 1401-1412. Built by The Baldwin Locomotive Works.

Tractive force	70,600 lb.
Cylinders, diameter and stroke	26½ in. x 32 in.
Drivers, diameter	69 in.
Weight on drivers	290,000 lb.
Weight on front truck	98,500 lb.
Weight on trailing truck	118,000 lb.
Total weight of engine	506,500 lb.
Weight of tender, ⅔ loaded	340,500 lb.
Driving wheel base	19 ft. 3 in.
Total engine wheel base	46 ft. 10 in.
Fuel	Soft coal
Grate area	106.7 sq. ft.
Steam pressure	255 lb
Evaporative heating surface	573 + 4,401 = 4,974 sq. ft.
Superheating surface (Type E)	2,170 sq. ft.
Tender capacity	22,000 gal., 30 tons





Pennsylvania Railroad 4-4-4-4 Duplex Type (Four-Cylinder, Divided-Drive, Rigid-Frame) Locomotive with Franklin Steam Distribution System and poppet valves, for heavy high-speed passenger service as originally built for Class T-1, Road Nos. 6110-6111, by The Baldwin Locomotive Works.

Note: Later 25 additional locomotives, Nos. 5500-5524 were built by the Pennsylvania Railroad at their Altoona Shops, and 25, Nos. 5525-5549, were built by The Baldwin Locomotive Works. Engine truck was equalized with first two pairs of drivers, and trailer truck with last two pairs, also changes made in the nose and skirting on the later locomotives.

Descriptions: *Railway Mechanical Engineer,* January 1943; *Railway Age,* December 12, 1942

Test Results: *Railway Mechanical Engineer,* July, 1945; *Railway Age,* May 26, 1945.

(Left) Front view of Pennsylvania Class T-1 locomotive.

Dimensions and Weights of Locomotive

Tractive force	64,650 lb.
Cylinders, diameter and stroke (4)	19¾ in. x 26 in.
Steam distribution	Franklin with poppet valves
Drivers, diameter	80 in.
Weight on drivers	279,910 lb.
Weight on front truck	99,570 lb.
Weight on trailing truck	122,720 lb.
Total weight of engine	502,200 lb.
Driving wheel base	25 ft. 4 in.
Total engine wheel base	51 ft. 11 in.
Wheel base, engine and tender	107 ft. 0 in.
Boiler type	Modified Belpaire
Boiler diameter	front 91½ in., back 100 in.
Firebox	138 in. x 96 in.
Combustion chamber, length	96 in.
Tubes	184, 2¼ in.
Flues	69, 5½ in.
Firebox volume	676.2 cu. ft.
Min. gas area	10.82 sq. ft.
Fuel	Soft coal
Grate area	92 sq. ft.
Steam pressure	300 lb.
Evaporative heating surface	499 + 3,719 = 4,218 sq. ft.
Superheating surface (Type AS)	1,680 sq. ft.

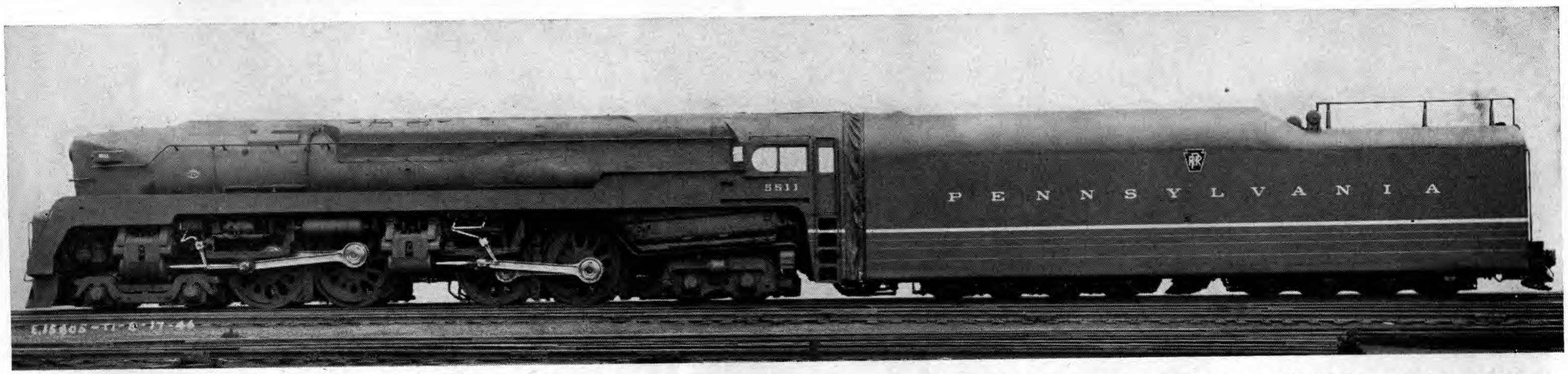
Tender Data

Tender class	180P84
Tank capacity, water	19,200 gal.
Fuel capacity, coal	85,200 lb.
Weight, loaded	442,500 lb.
Wheels	Sixteen, 36 in.
Journal	6½ in. diam, roller bearing

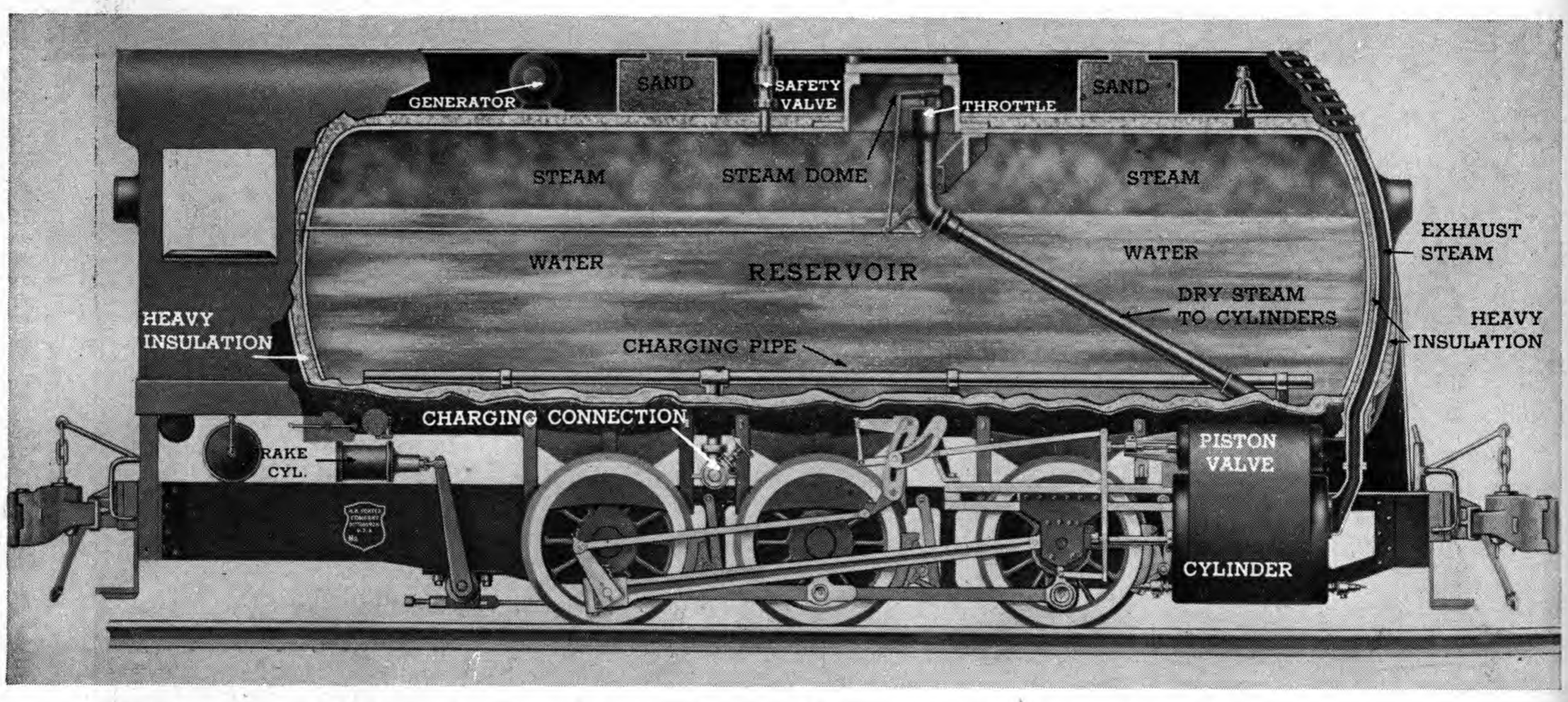
Test Data

See *Railway Mechanicl Engineer,* July 1945; *Railway Age,* May 26, 1945	
Max. drawbar horsepower	6,110
Max. indicated horsepower	6,552
Speed	85.5 m.p.h.
Cutoff	25 per cent
Boiler pressure	295 lb.
Steam chest pressure	287 lb.
Steam chest temperature	757 deg. F.
Steam to engine per hr.	101,219 lb.
Steam per i. hp. hr.	15.4 lb.
Max. boiler capacity	105,475 lb.
Speed	100 m.p.h.
Cutoff	20 per cent
Firing rate	252.2 lb.

Descriptions: *Railway Mechanical Engineer,* March and April 1945; *Railwcy Age,* Feb. 17, 1945.

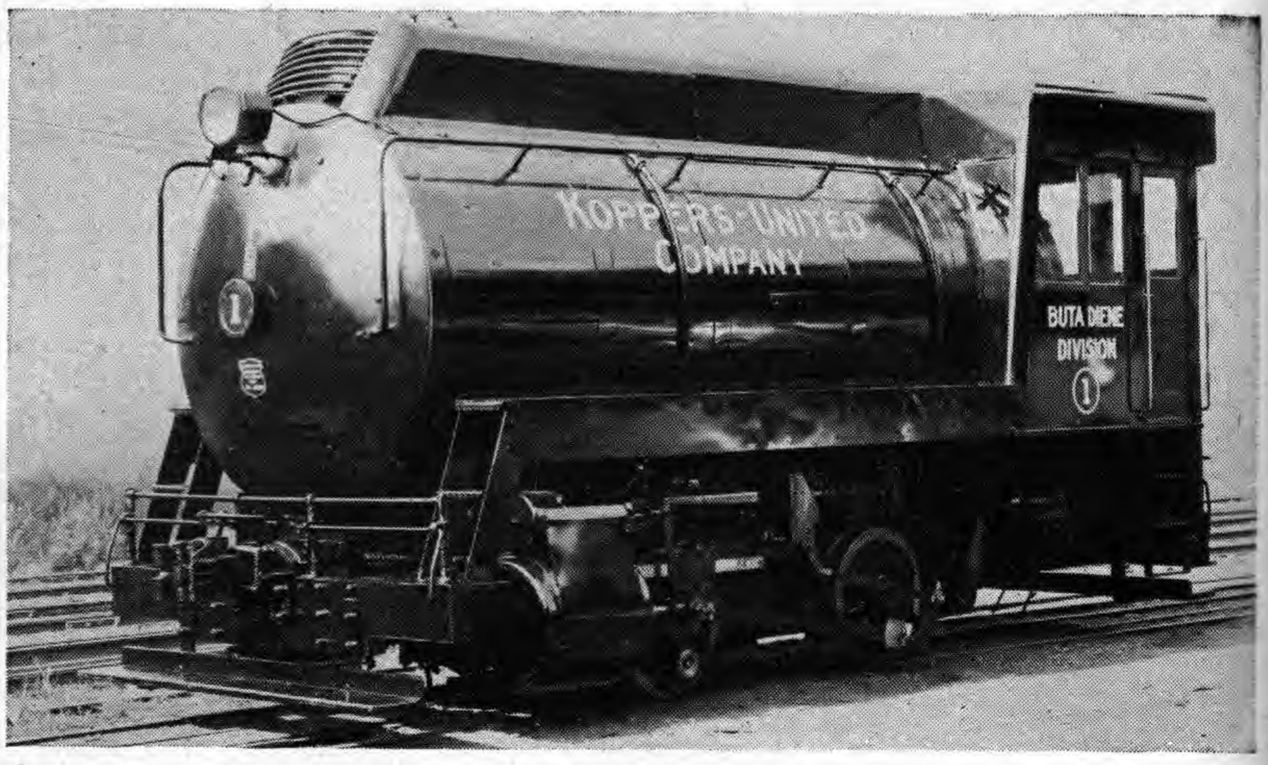


Pennsylvania 4-4-4-4 Duplex Type Locomotive, Class T-1, Road Nos. 6110-6111 and 5500-5549. Four-cylinder, Divided-Drive, Rigid-Frame with Franklin Steam Distribution System and Poppet Valves. For heavy high-speed passenger service.



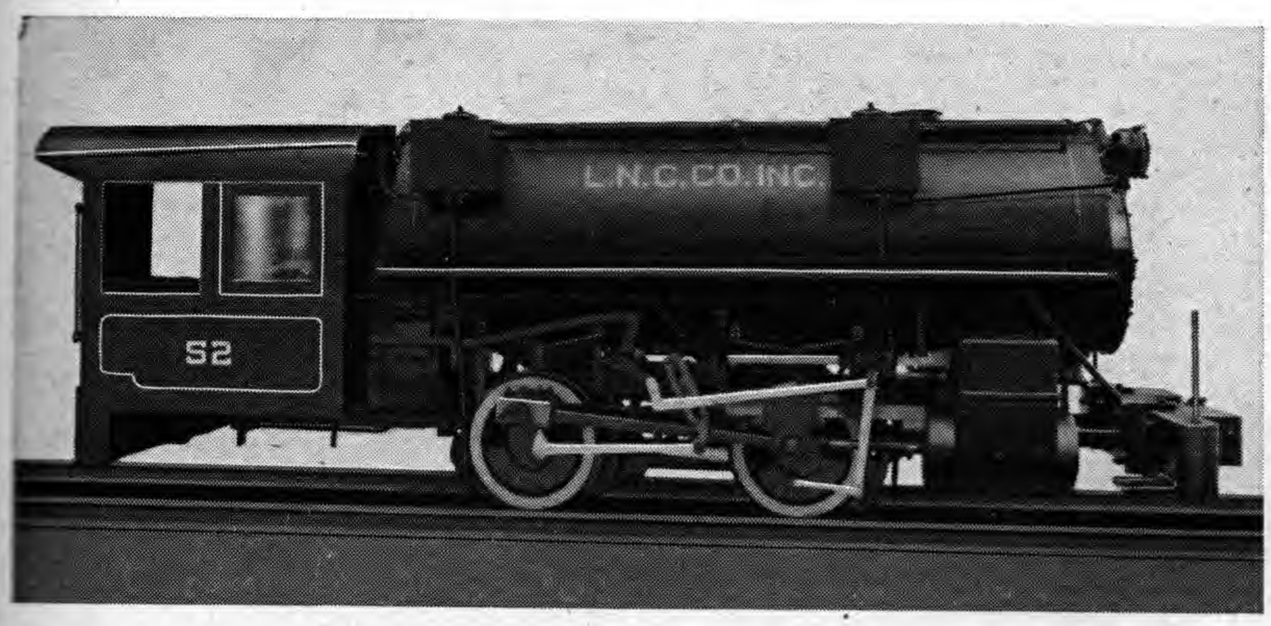
Cut-away view showing essential features of construction of a Fireless Locomotive.

0-6-0 Type 75 Ton Steam Storage Fireless Locomotive. Built for Firestone Tire & Rubber Co.



0-4-0 Type 45-Ton Steam Storage Fireless Locomotive. Built for Koppers-United Company Buta Diene Division

Davenport Locomotive Works

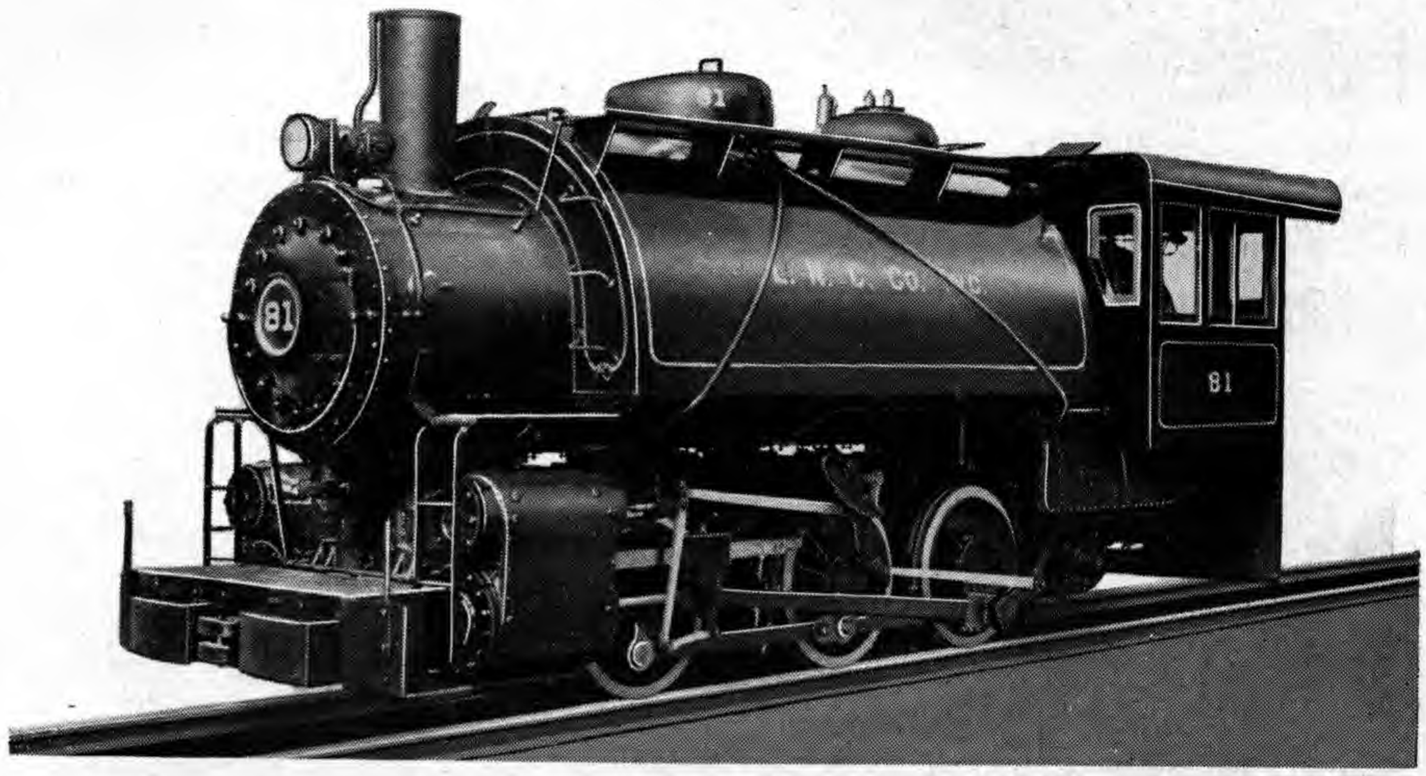


(Left) Vulcan 0-4-0-T Saddle-Tank Steam Switcher for the Lehigh Navigation Coal Company.

Gage	3 ft. 6 in.
Cylinders	12 in. x 16 in.
Steam pressure	170 lb.
Drivers	33 in.
Wheel base	5 ft.
Heating surface, firebox	50½ sq. ft.
Heating surface, tubes	410 sq. ft.
Weight	50,000 lb.
Tractive force	10,085 lb.
Water	800 gal.

Vulcan 0-6-0T Type Saddle Tank Locomotive for switching service. Built for Lehigh Navigation Coal Co.

Gage	3 ft. 6 in.
Cylinders	17½ in. x 24 in.
Steam Pressure	190 lb.
Diameter of Drivers	42 in.
Tractive Force	27,000 lb.
Wheel Base	10 ft. 8 in.
Heating Surface	1,535 sq. ft.
Weight of Engine	127,000 lb.
Fuel	Coal



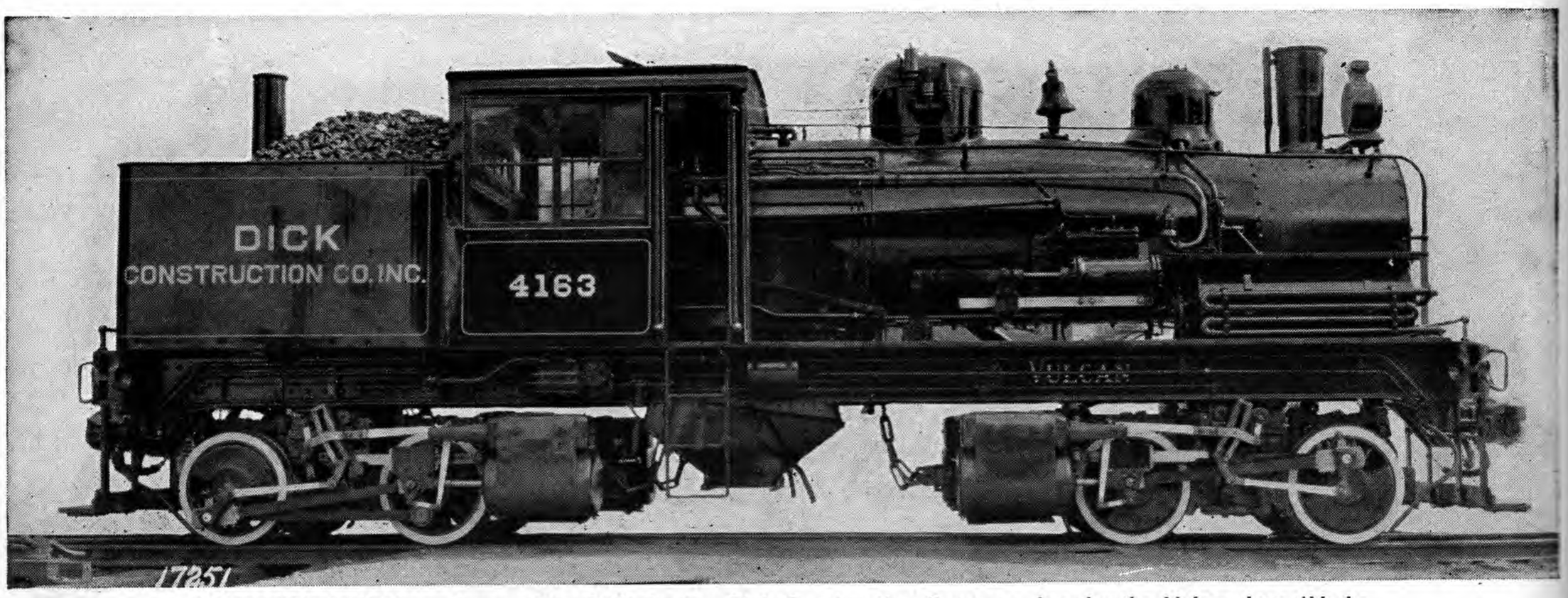
Vulcan 0-6-0T Type Saddle Tank Locomotive for Switching Service. Built for Lehigh Valley Coal Co.

Gage	3 ft. 0 in.
Cylinders	12 in. x 16 in.
Steam Pressure	180 lb.
Diameter of Drivers	33 in.
Tractive Force	10,680 lb.
Wheel Base	7 ft. 10 in.
Heating Surface, Tubes	507 sq. ft.
Heating Surface, Firebox	48 sq. ft.
Heating Surface, Total	555 sq. ft.
Weight	54,000 lb.
Fuel	Coal

Gage	3 ft. 3⅜ in.
Cylinders	15 in. x 22 in.
Steam pressure	225 lb.
Diameter of drivers	42 in.
Tractive force	22,540 lb.
Wheel base, driving	10 ft. 6 in.
Wheel base, engine	17 ft. 6 in.
Heating surface, firebox	98 sq. ft.
Heating surface, tubes	466 sq. ft.
Heating surface, flues	225 sq. ft.
Superheating surface	170 sq. ft.
Grate area	15.2 sq. ft.
Weight on drivers	80,000 lb.
Weight of engine	93,500 lb.
Fuel	Oil

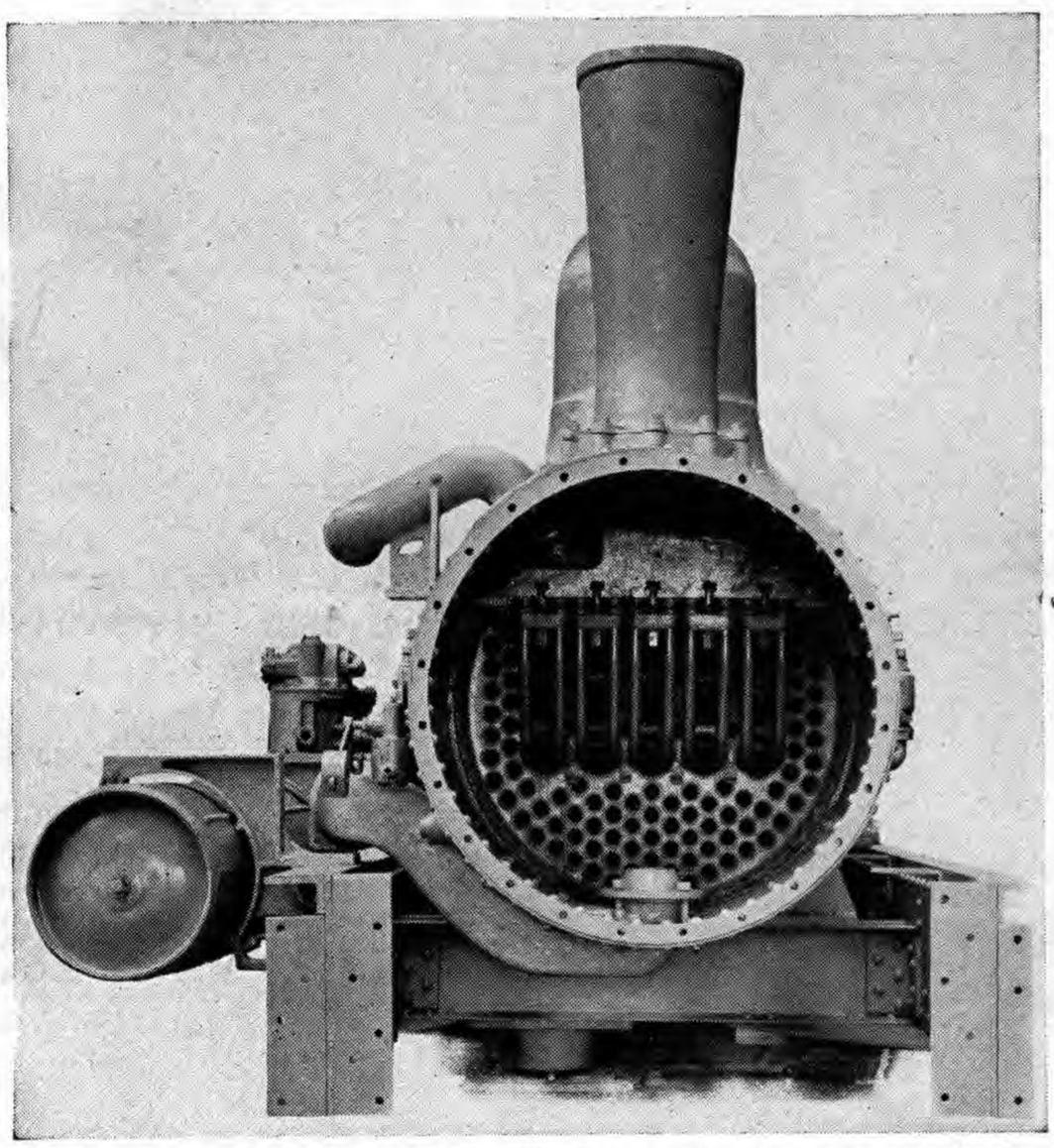
Vulcan 2-6-0 Type Locomotive built for Patino Mines and Enterprises Consolidated, Boliva.

Vulcan Iron Works

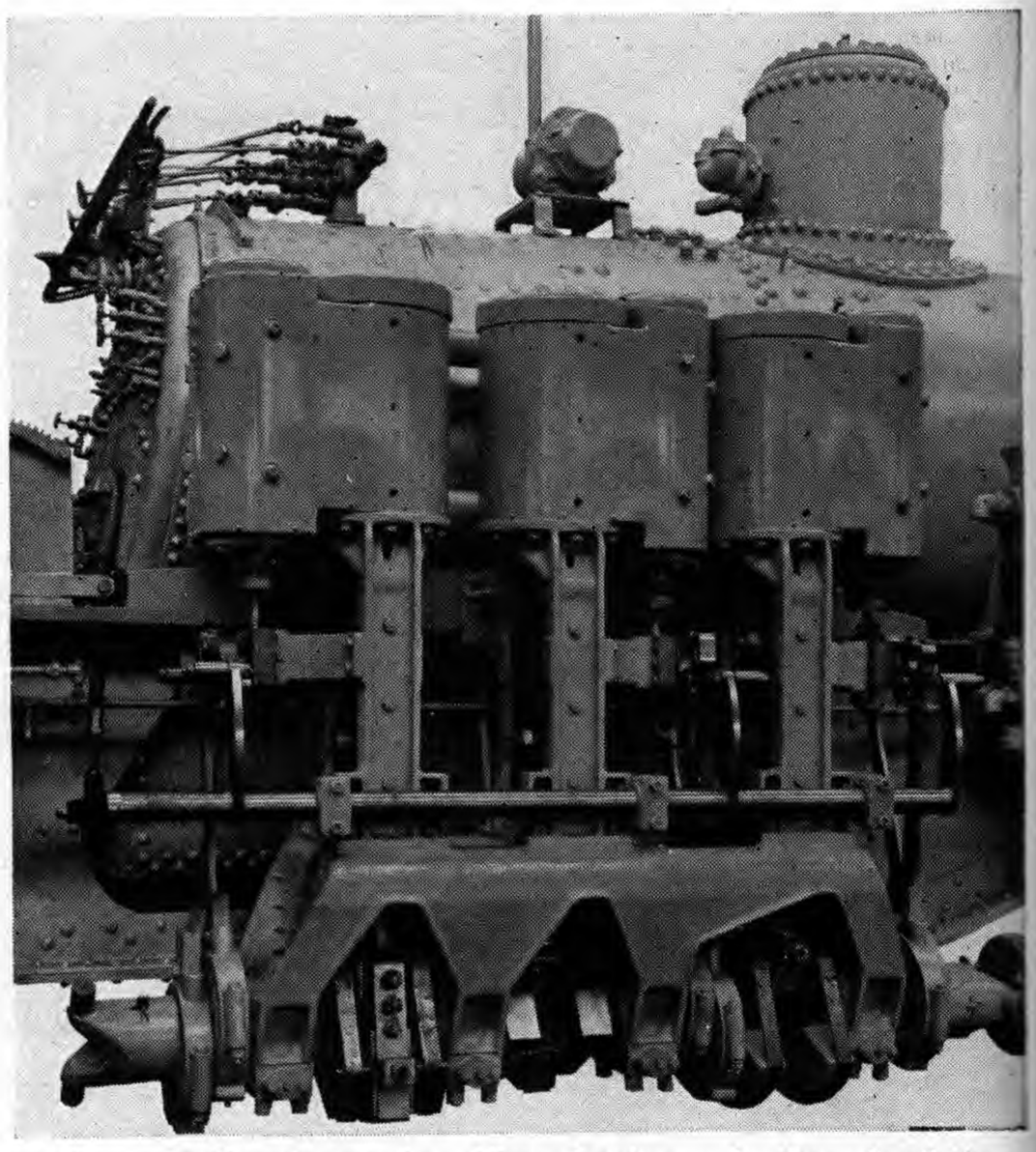


Vulcan "Duplex" Steam Locomotive. Built for the Dick Construction Company, Inc. by the Vulcan Iron Works.

Gage	**4 ft. 8½ in.**	Driving wheel base	5 ft. 0 in.
Cylinders (4)	13 in. x 16 in.	Heating surface, tubes	780 sq. ft.
Steam pressure	200 lb.	Heating surface, firebox	75 sq. ft.
Diameter of drivers	33 in.	Heating surface, total	855 sq. ft.
Tractive force	27,860 lb.	Grate area	17.8 sq. ft.



Pacific Coast Shay Locomotive—Smokebox Front removed—Boiler mounted off-center for balance.



Pacific Coast Shay Locomotive—View showing application of cylinders to girder frame.

Pacific Coast "Shay Geared" Locomotive. Built for Bloedel, Stewart & Welch, Ltd. by Lima Locomotive Works, Inc.

Gage 4 ft. 8½ in.; Three Cylinders 13 in. x 15 in.; Steam Pressure 200 lb.; Drivers 36 in.; Tractive Force 38,200 lb.; Total Wheel Base 41 ft. 2 in.; Evaporative Heating Surface 905 sq. ft.; Superheating Surface 189 sq. ft.; Grate Area 27.75 sq. ft.; Total Weight 188.000 lb.

Locomotive Tenders

Tender Trucks

THE FUNCTION OF THE TENDER is to carry the amount of fuel and water that may be required by the locomotive for a run between convenient sources of supply. With the large size and power of the latest steam locomotives and the marked tendency at the present time toward extensions in the length of locomotive runs, the capacities of the tenders for both freight and passenger service has been increased correspondingly. The latest tenders have a water capacity of from 20,000 gal. to 26,000 gal., a coal capacity of from 25 tons to 46 tons and a weight loaded of from 300,000 lb. to 440,000 lb.

The usual tender for a long period was of the rectangular type with water legs at the front on each side of the coal space, the back of the coal space having either a flat or a sloping bottom. With the elevation of the deck of the locomotive the use of a water bottom underneath the entire coal space became quite general. Switch engines on some roads are equipped with tenders having a sloping back as this design gives the engineman a better view when backing up. Instead of rectangular water tanks, modified cylinder and cylindrical or Vanderbilt tanks are used on many roads.

The reduction in the number of rivets and the resultant decrease in annoyance due to leakage has led some roads to follow the practice of welding the tender sheets together. On the inside the water tanks are provided with splash or swash plates to minimize the surge of the water. The use of cast steel for the underframe is quite general as this construction lends itself to stiffness and thus reduces the dangers of racking, rusting and leakage. In many recent designs the steel casting forming the underframe has been modified to serve also as the water tank bottom, the side sheets being riveted or welded to the steel casting.

The latest designs of large-capacity tenders are assembled on a tender bed in which the rear carrying wheels and axles are held by pedestals which are cast integrally with the bed, and a guiding truck is used at the front end.

As the larger locomotives are now equipped with mechanical stokers provision must be made on the tenders for the hopper, conveyor and other necessary parts including the stoker engine in some cases. Some tenders are equipped with coal pushers to bring the coal to the fireman or stoker conveyor.

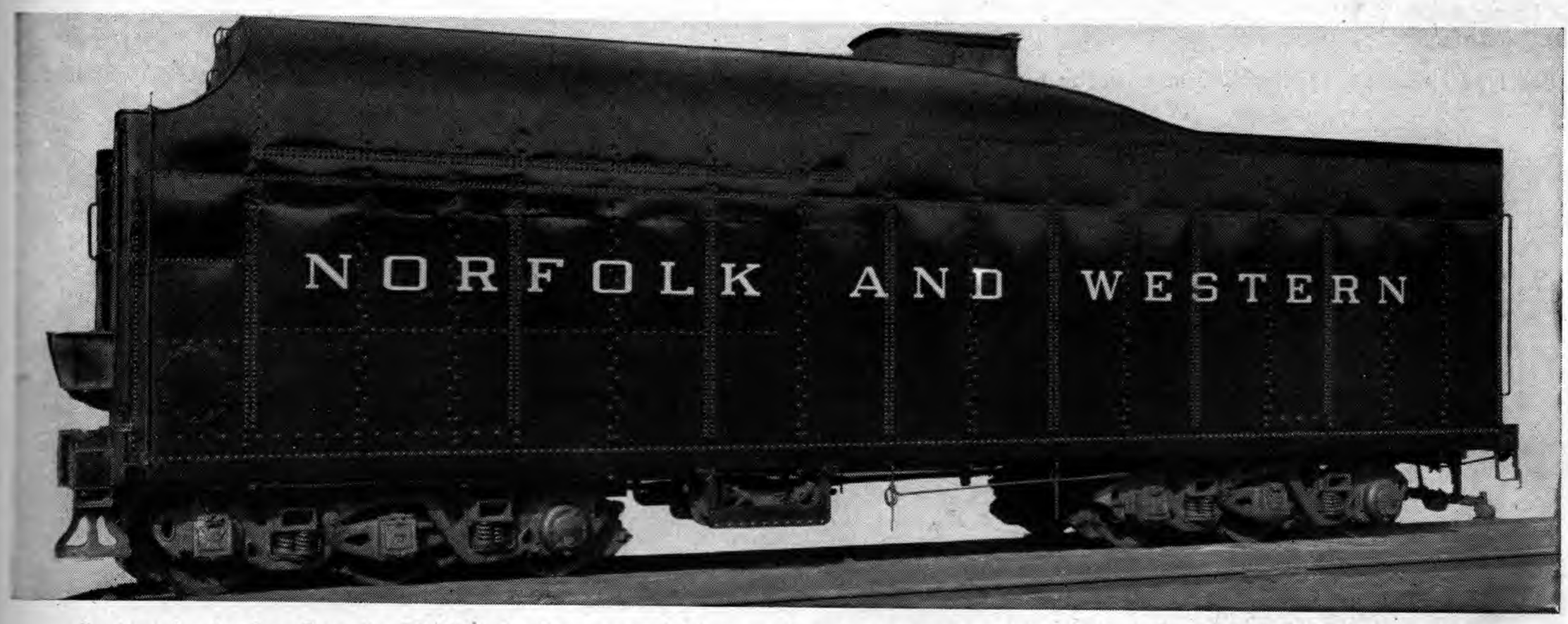
What has been said thus far applies especially to tenders for coal burning locomotives. Where oil is the fuel used an oil tank replaces the usual coal space. Oil tanks may be used in conjunction with either rectangular or cylindrical water tanks.

On some roads, where traffic is heavy and passenger schedules fast, tenders are fitted with water scoops for taking water from track tanks while the locomotive is running.

Tender Trucks

Tender trucks, while following certain details used in those employed under freight and passenger cars, usually differ in certain particulars required for tender service. Tenders of the larger sizes are carried on six- or eight-wheel trucks, when the weight exceeds the capacity of four-wheel trucks.

Brakes, couplers, drawbars and some other details which are required to make up the complete tender are for convenience of treatment covered in separate sections.



Rectangular tender. Capacity 22,000 gal. of water and 30 tons of coal; weight, loaded, 378,600 lb. Size of journals 6½ in. x 12 in.

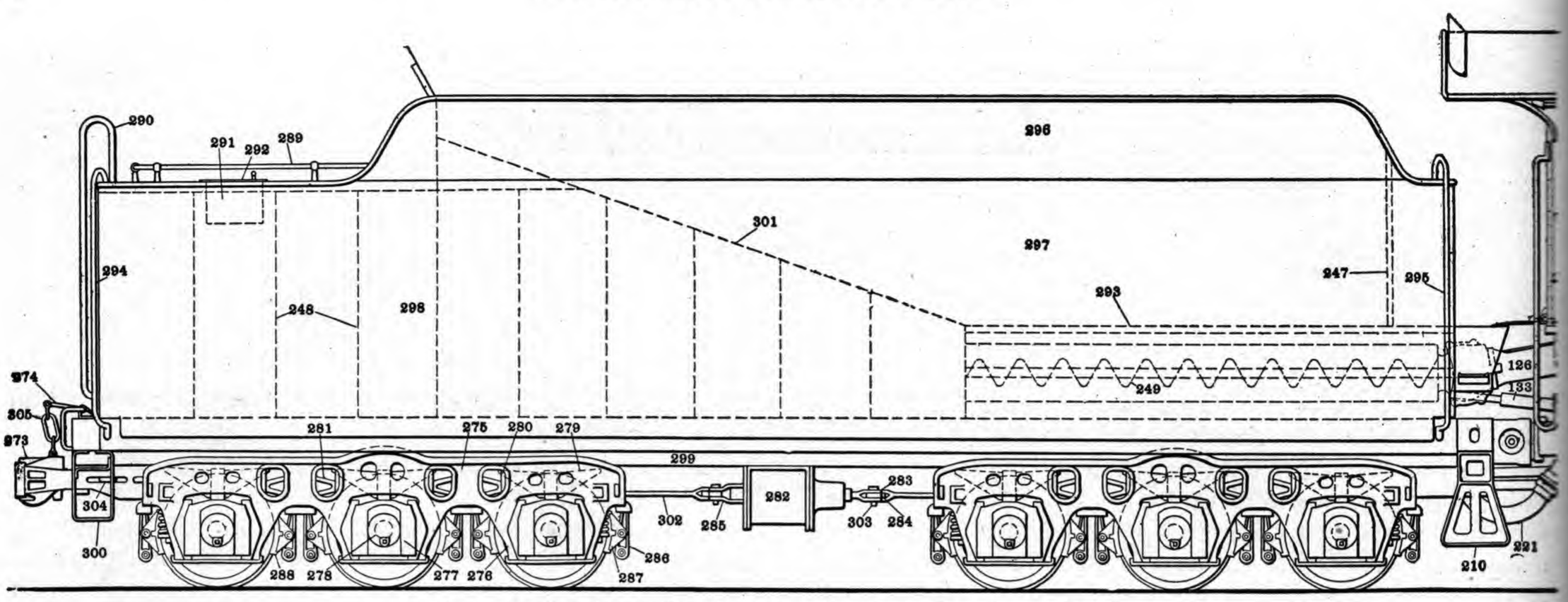
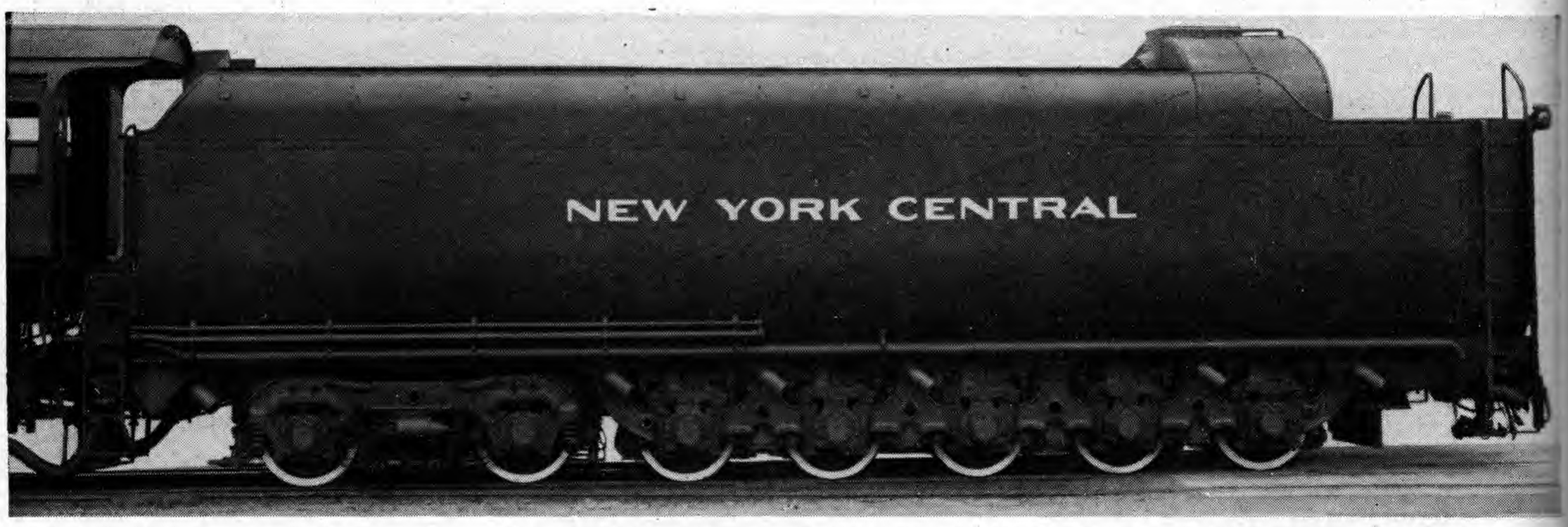


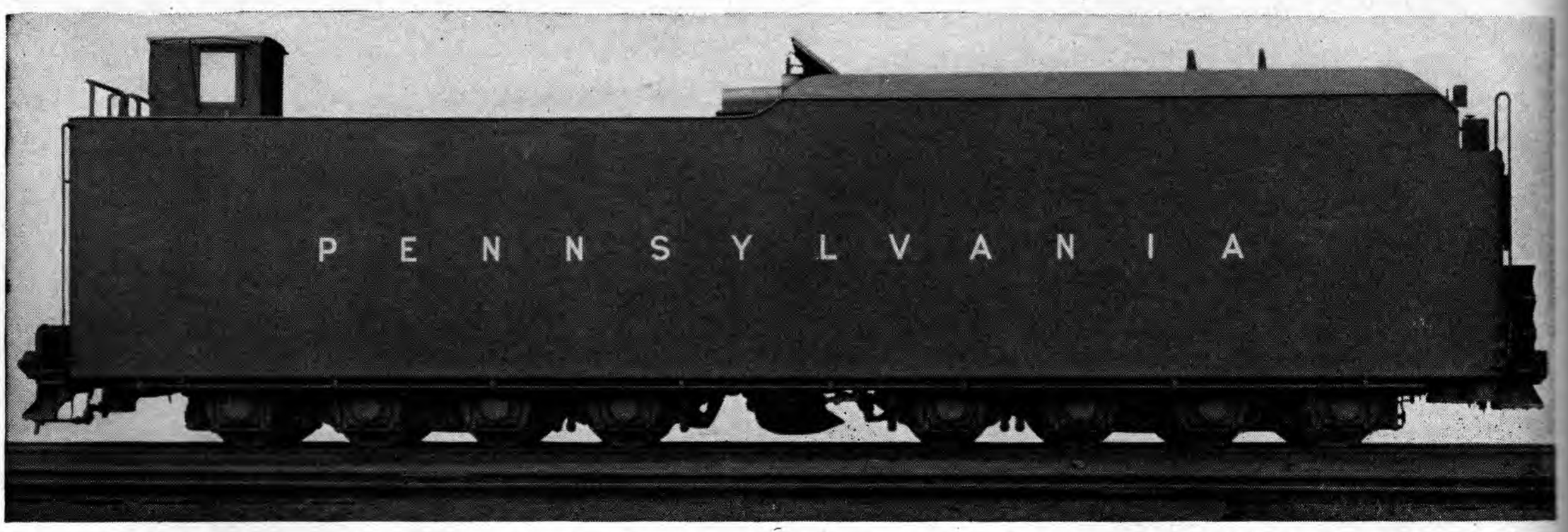
Diagram of a locomotive tender with principal parts numbered.

Names of Principal Parts of a Locomotive Tender

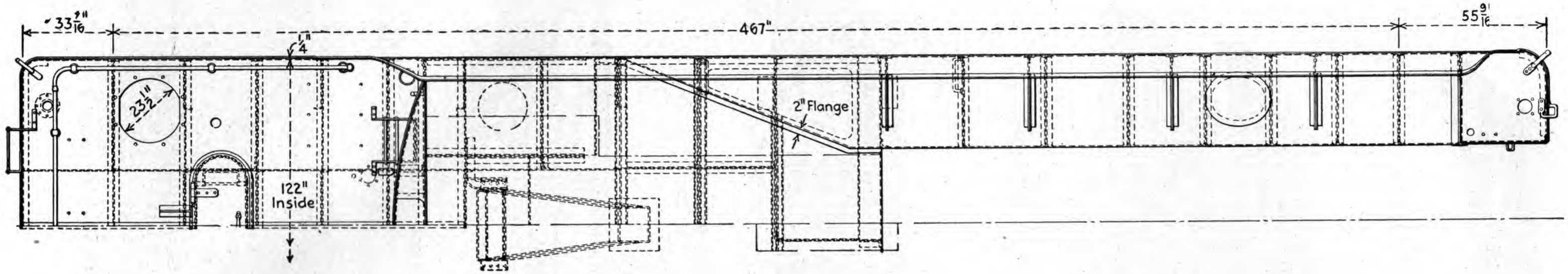
126. *Stoker Intermediate Conveyor*
133. *Stoker Drive Shaft*
210. *Tender Gangway Step*
221. *Tank Water Hose*
247. *Coal Gate*
248. *Tender Bracing and Splash Plates*
249. *Tender Coal Conveyor Screw to Stoker*
273. *Tender Coupler*
274. *Tender Uncoupling Rod*
275. *Tender Truck Frame*
276. *Tender Truck Pedestal*
277. *Tender Journal Box*
278. *Tender Journal Bearing*
279. *Tender Truck Spring*
280. *Tender Truck Spring Hanger*
281. *Tender Truck Equalizer*
282. *Tender Brake Cylinder*
283. *Tender Brake Cylinder Push Rod*
284. *Tender Brake Cylinder Lever*
285. *Tender Brake Lever Fulcrum*
286. *Tender Brake Hanger*
287. *Tender Brake Shoe Head*
288. *Tender Brake Shoe*
289. *Tender Hand Rail*
290. *End Ladder*
291. *Tender Filling Hole*
292. *Tender Filling Hole Cover*
293. *Tender Deck*
294. *Tender Rear Handhold*
295. *Tender Front Handhold*
296. *Tender Collar*
297. *Fuel Space*
298. *Water Tank or Cistern*
299. *Tender Frame*
300. *Tender Rear Step*
301. *Tender Slope Sheet*
302. *Tender Brake Rod*
303. *Tender Brake Pin*
304. *Tender Coupler Draft Key*
305. *Uncoupling Chain*

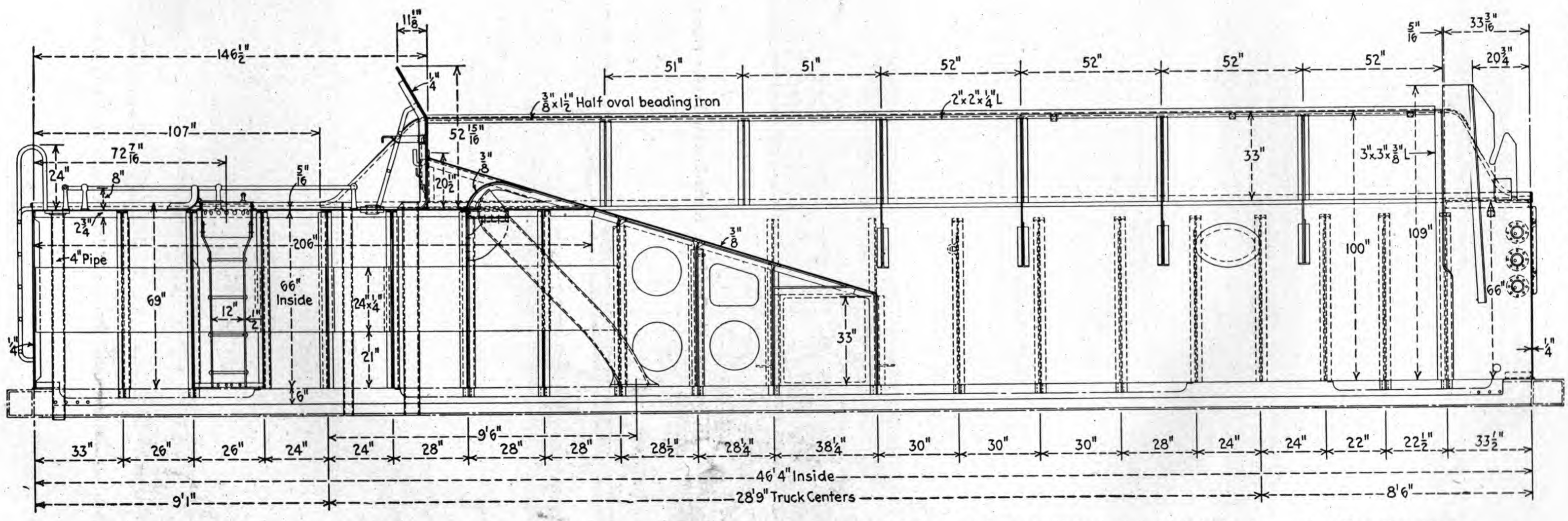


Bed type tender equipped with Commonwealth tender bed and water scoop. Capacity 18,000 gal. of water and 46 tons of coal. Weight loaded 420,000 lb.



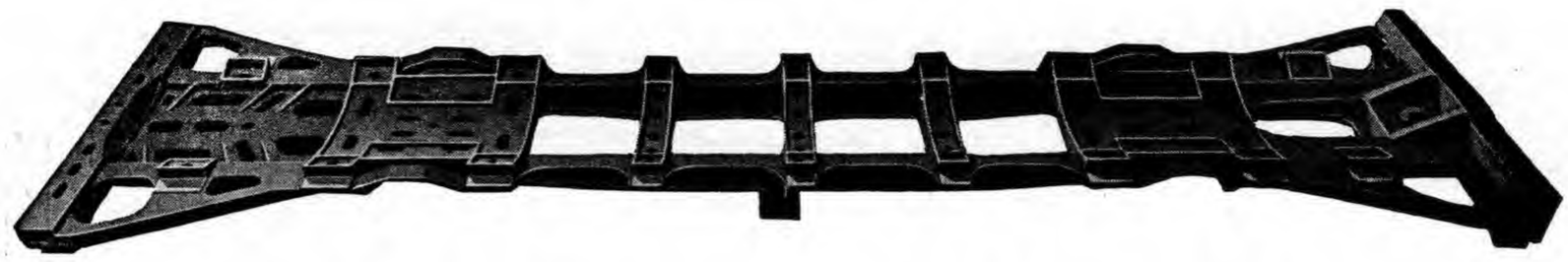
Eight-wheel truck tender in through freight service. Capacity, 20,500 gal. water, 30.9 tons coal, weight loaded, 411,400 lb.



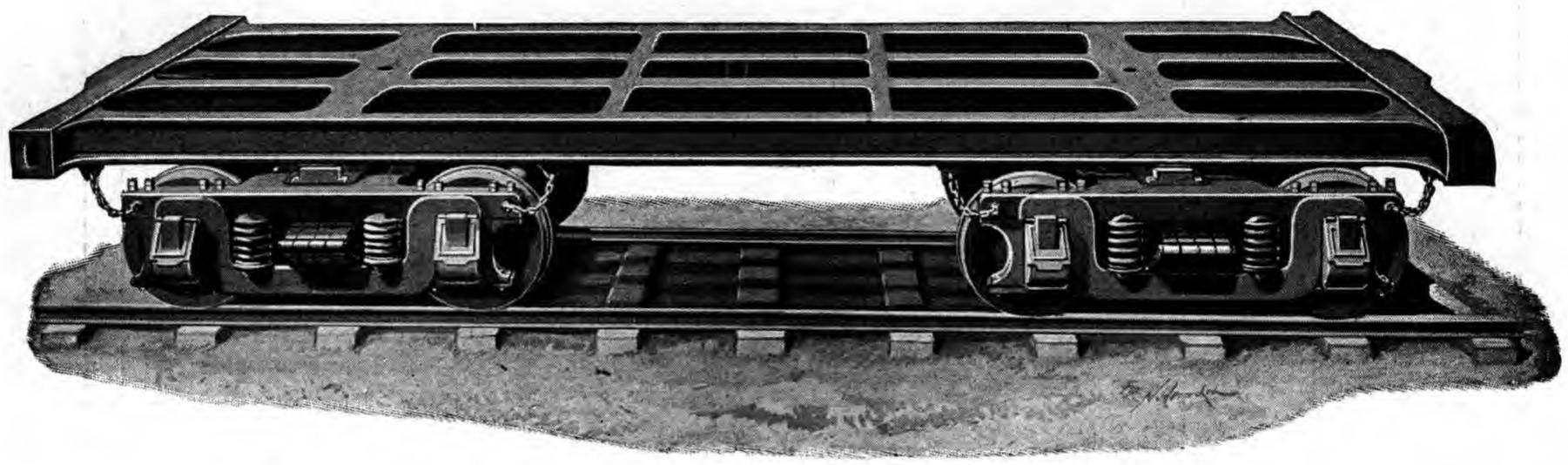


Tender for 4-8-2 type locomotive. Capacity 15,500 gal. water and 43 tons coal, lightweight 158,600 lb.; weight two-thirds loaded 302,240 lb. Equipped with water scoop.

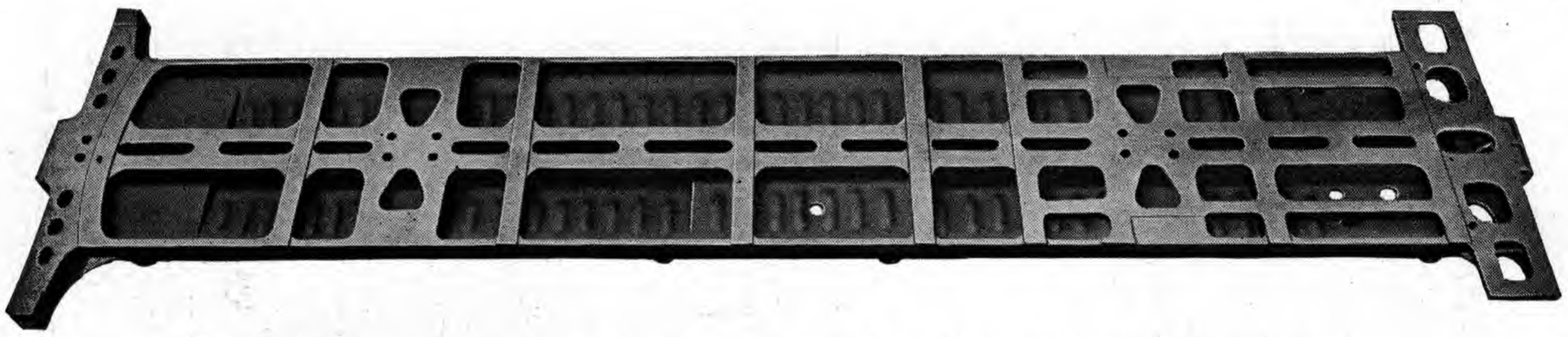
Notes: Later locomotive tenders have been equipped with Commonwealth beds. Developments have been made in the water scoop which permit operation at much higher speeds.



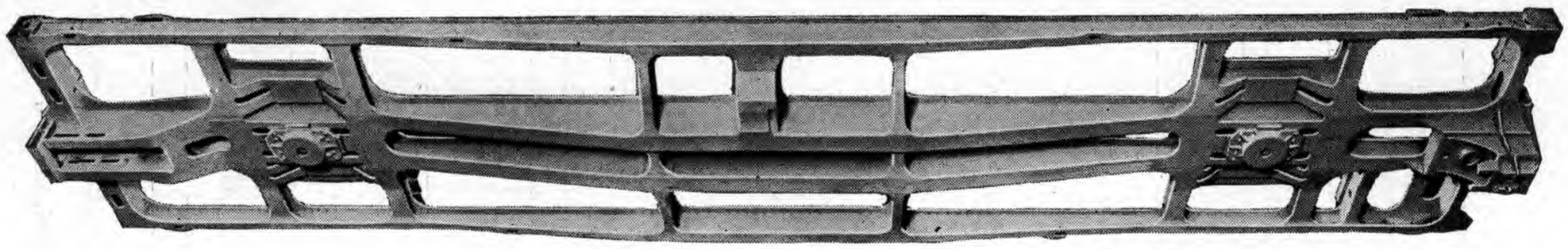
Commonwealth One-Piece Open-Bottom Tender Frame for Cylindrical Tank-Top View.



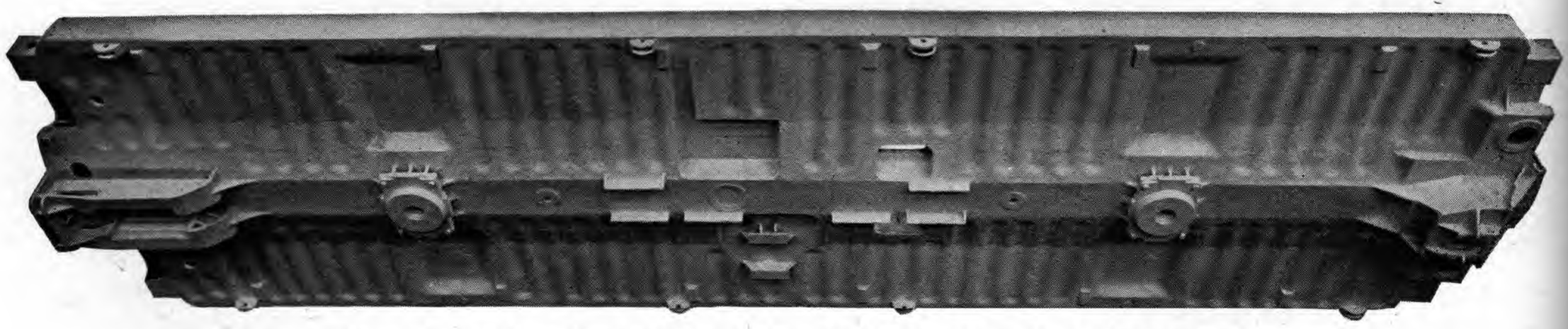
Commonwealth One-Piece Cast Steel Open Bottom Tender Frame mounted on Commonwealth Four-Wheel Swing-Motion Equalized Tender Trucks.



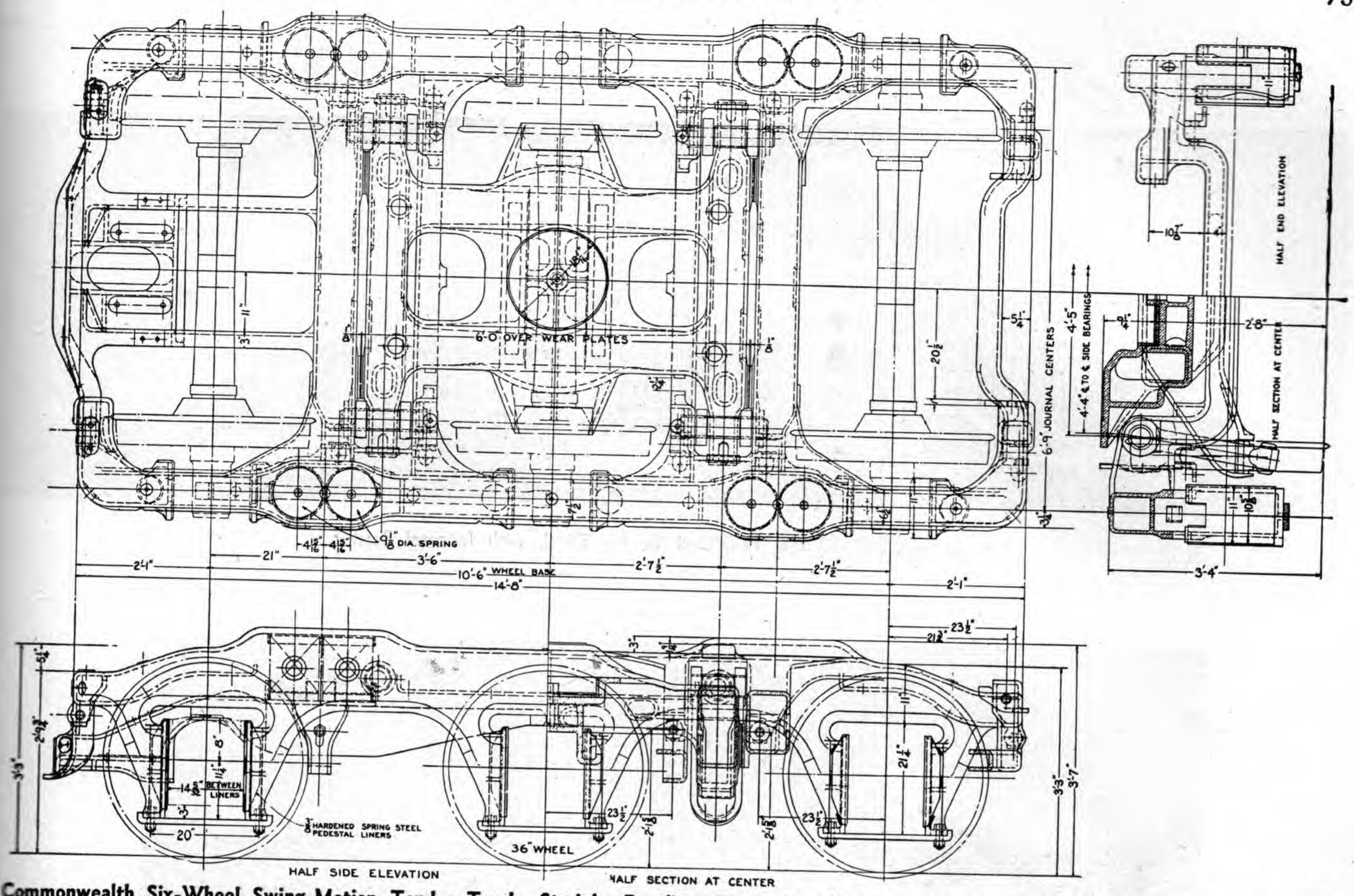
Commonwealth One-Piece Water-Bottom Tender Frame for cylindrical tank-top view.



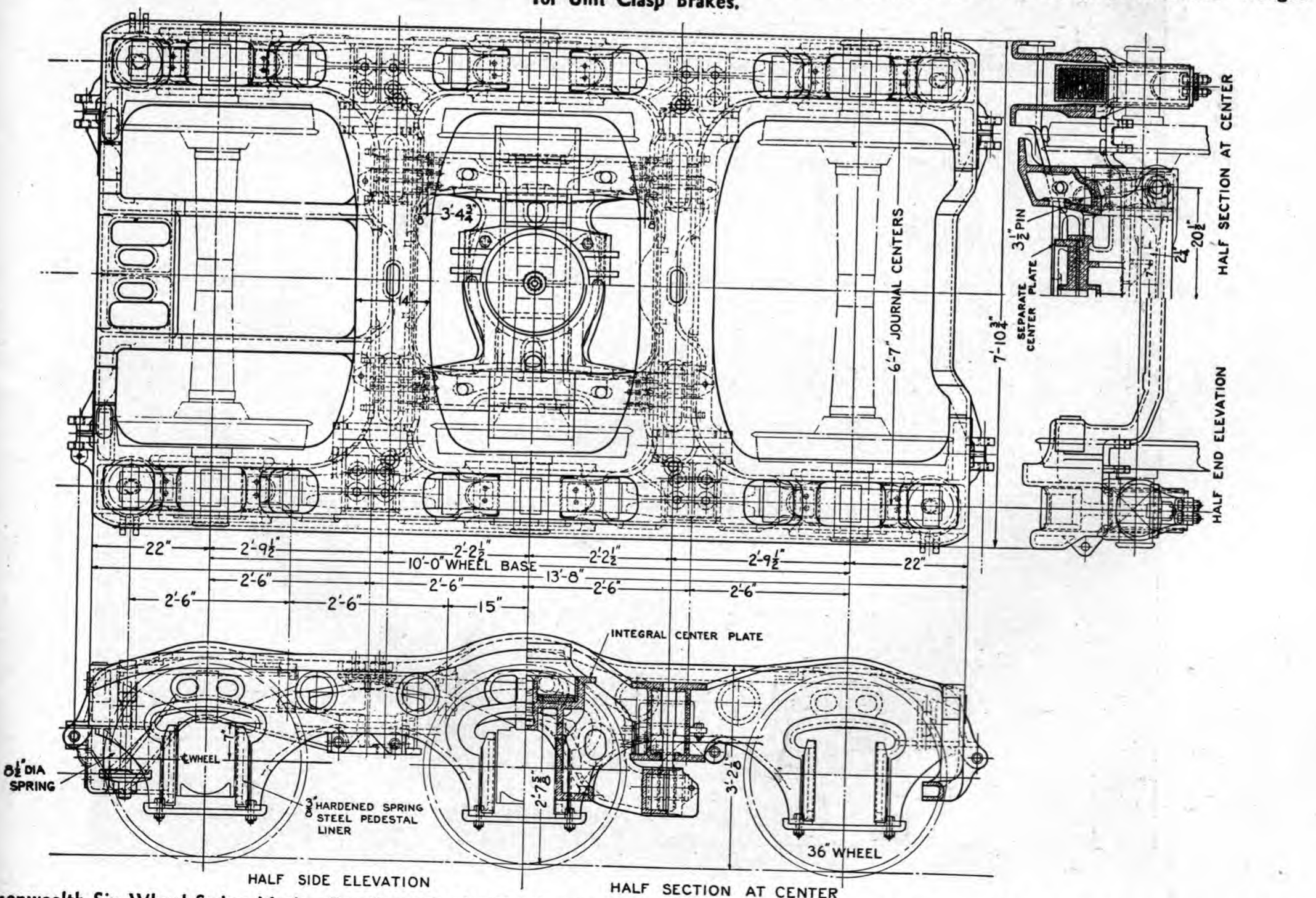
Commonwealth One-Piece Open-Bottom Tender Frame for rectangular tank—bottom view.



Commonwealth One-Piece Water-Bottom Tender Frame for rectangular tank—bottom view.

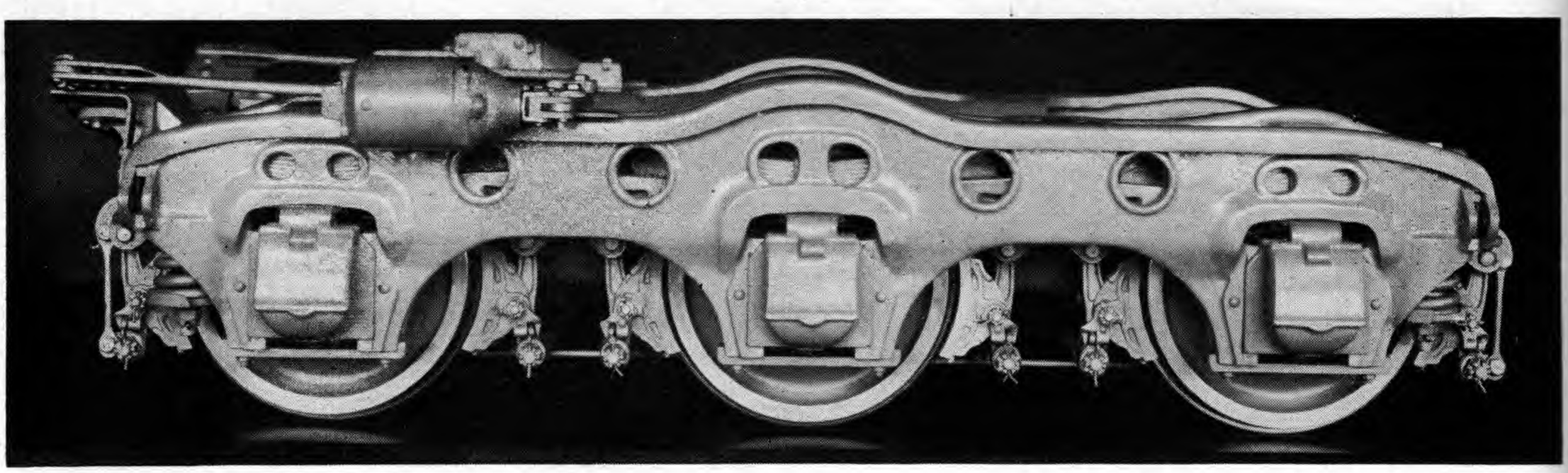


Commonwealth Six-Wheel Swing-Motion Tender Truck—Straight Equalizer Type with all coil springs, 6½ in. by 12 in. journals and arranged for Unit Clasp Brakes.

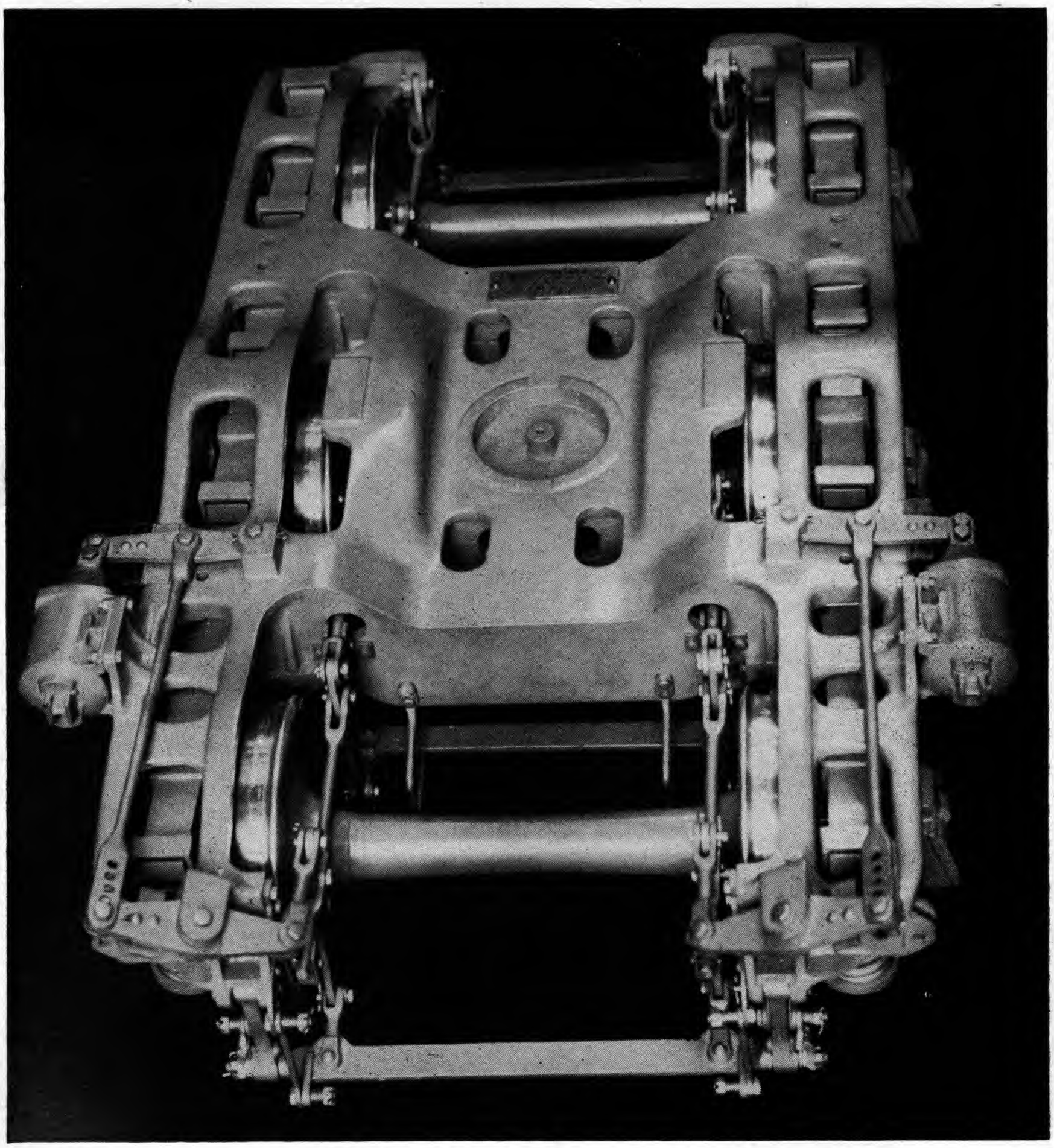


Commonwealth Six-Wheel Swing-Motion Equalized Tender Truck with Coil and semi-elliptic springs, 6½ in. by 12 in. journals and arranged for Unit Clasp Brakes.

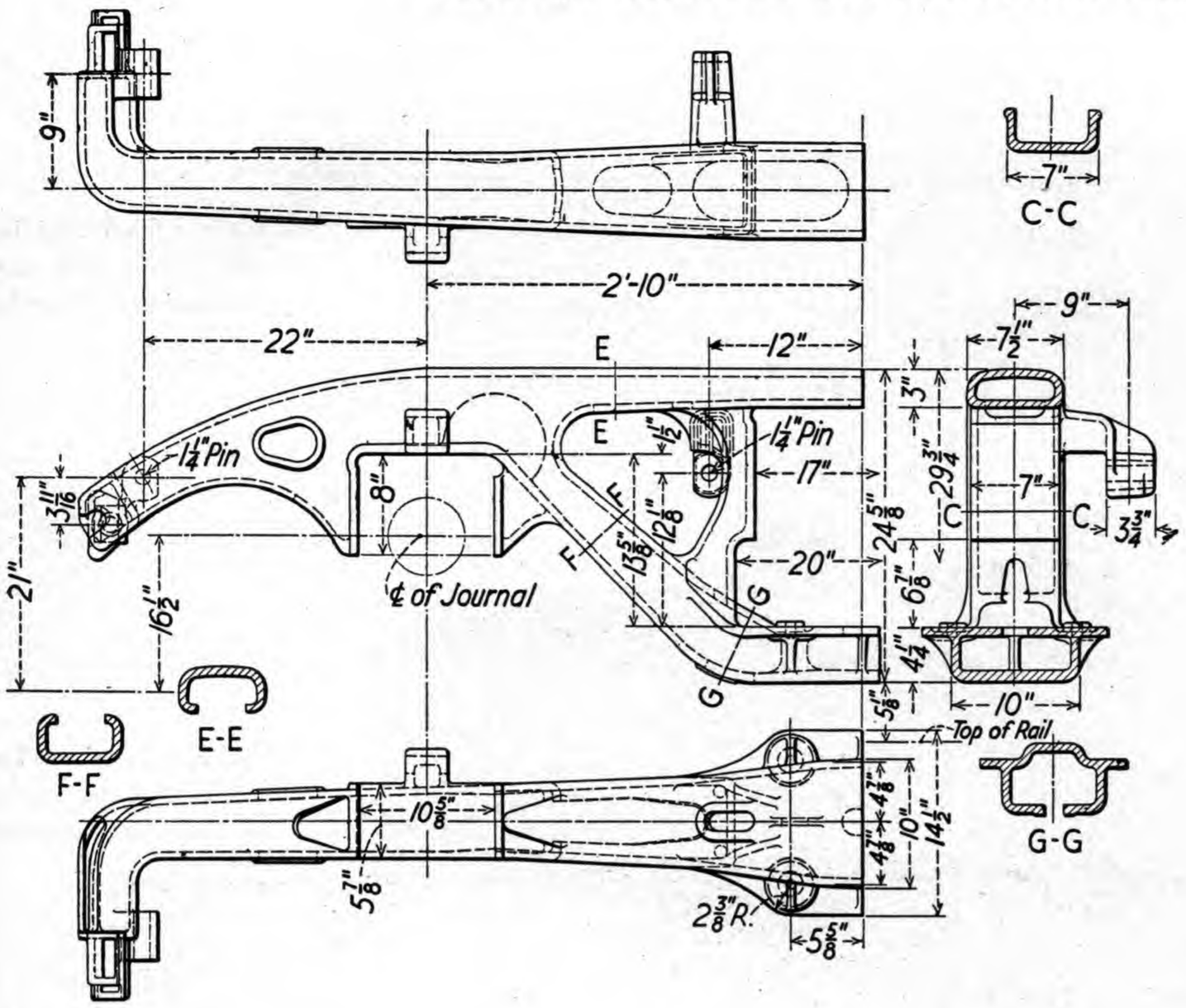
General Steel Castings Corporation



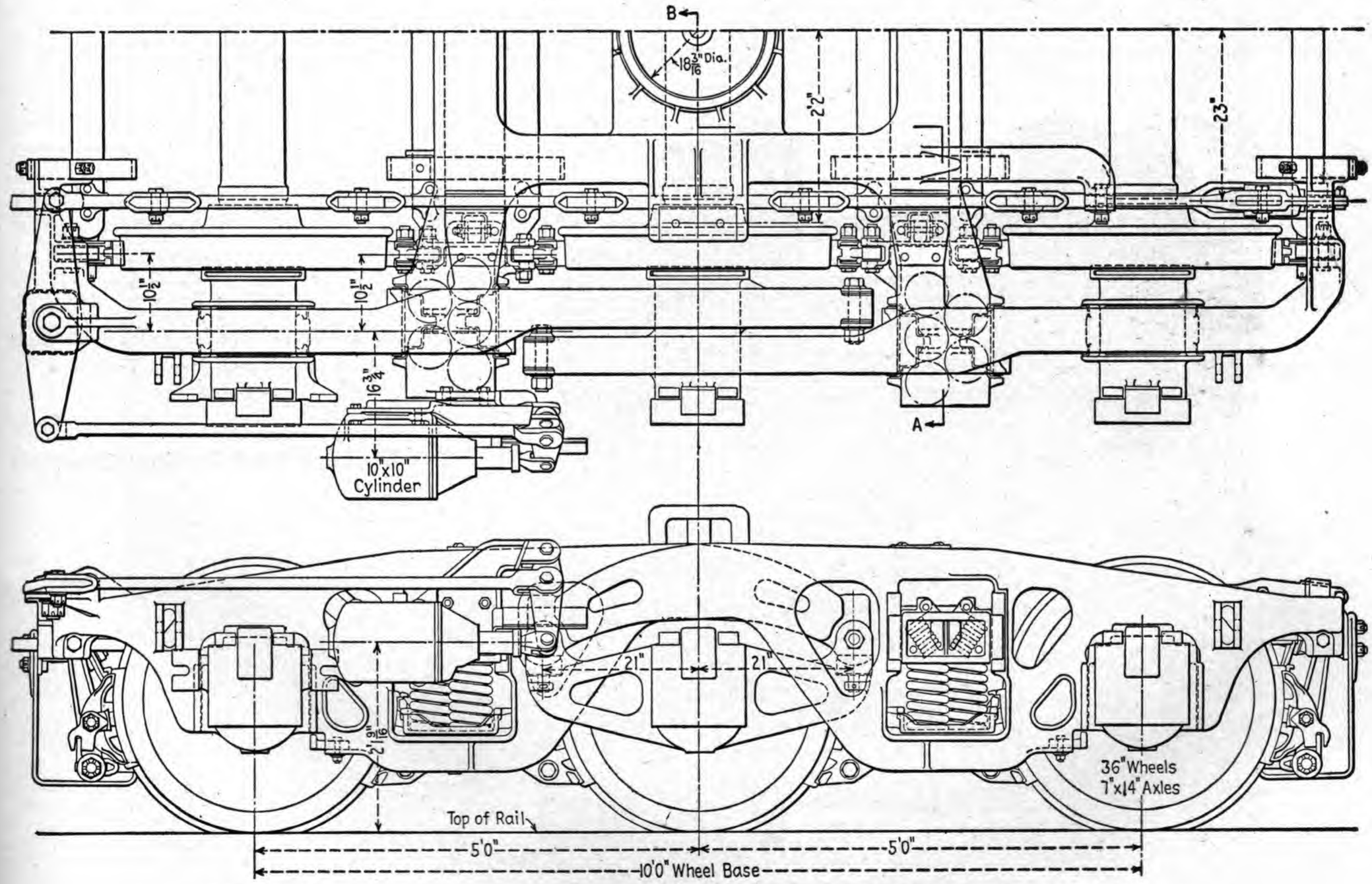
Commonwealth Six-Wheel Equalized Tender Truck with Integral Bolster.

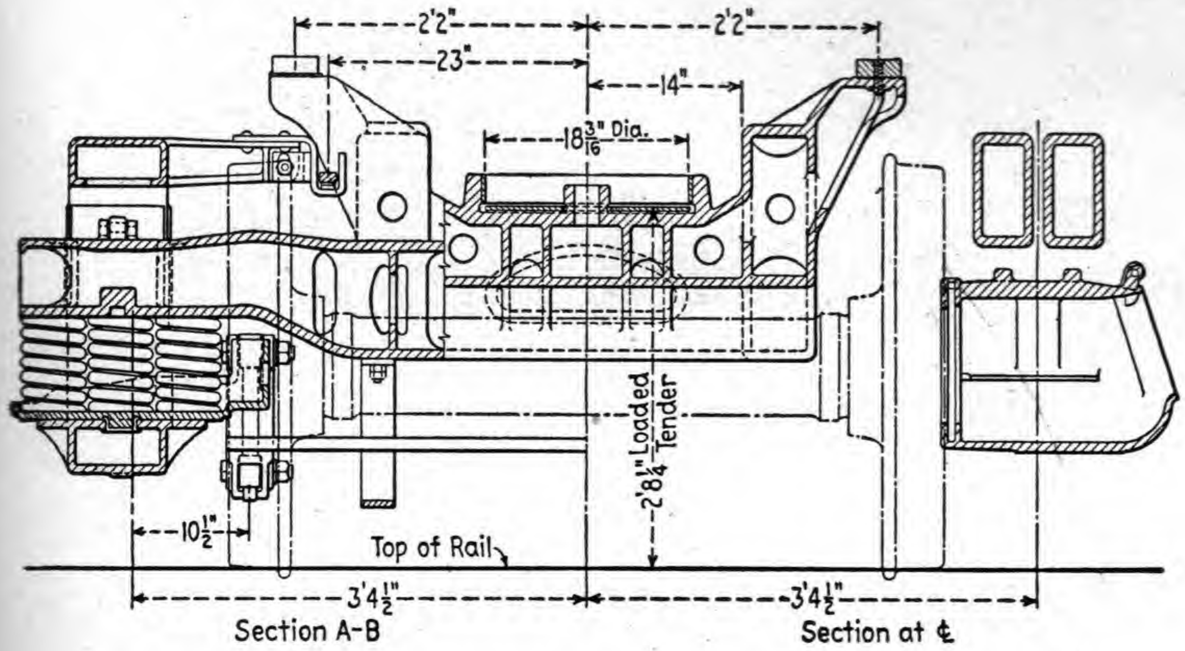


Commonwealth Six-Wheel Equalized Tender Truck with Integral Bolster (Top View).
General Steel Castings Corporation



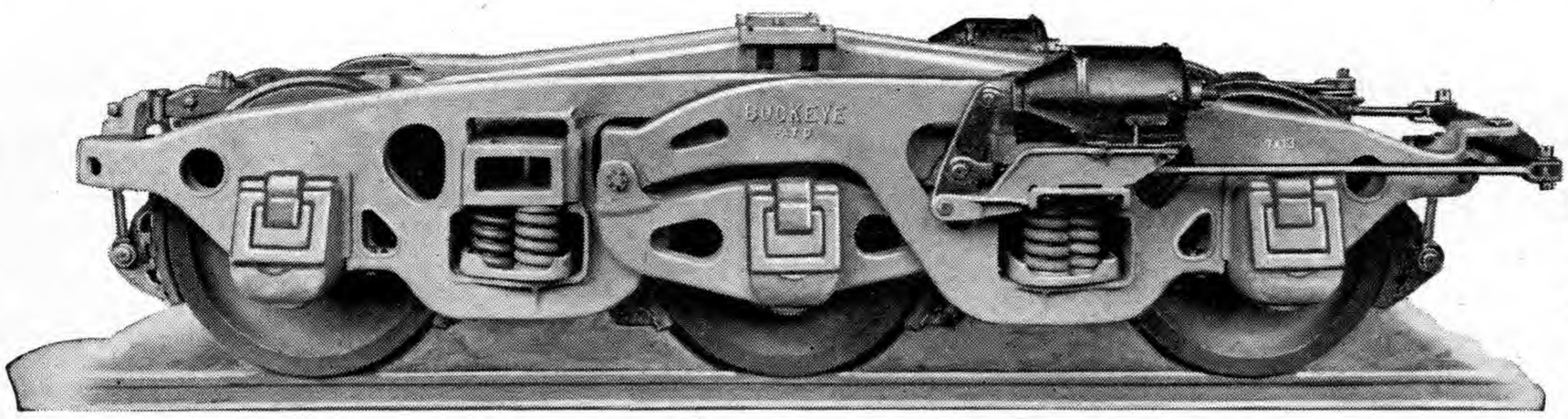
Buckeye Cast Steel Tender Truck Side Frame for Four-Wheel Truck, Double-Truss Type, for 6 in. x 11 in. journals and clasp brakes. The Buckeye Steel Castings Company.



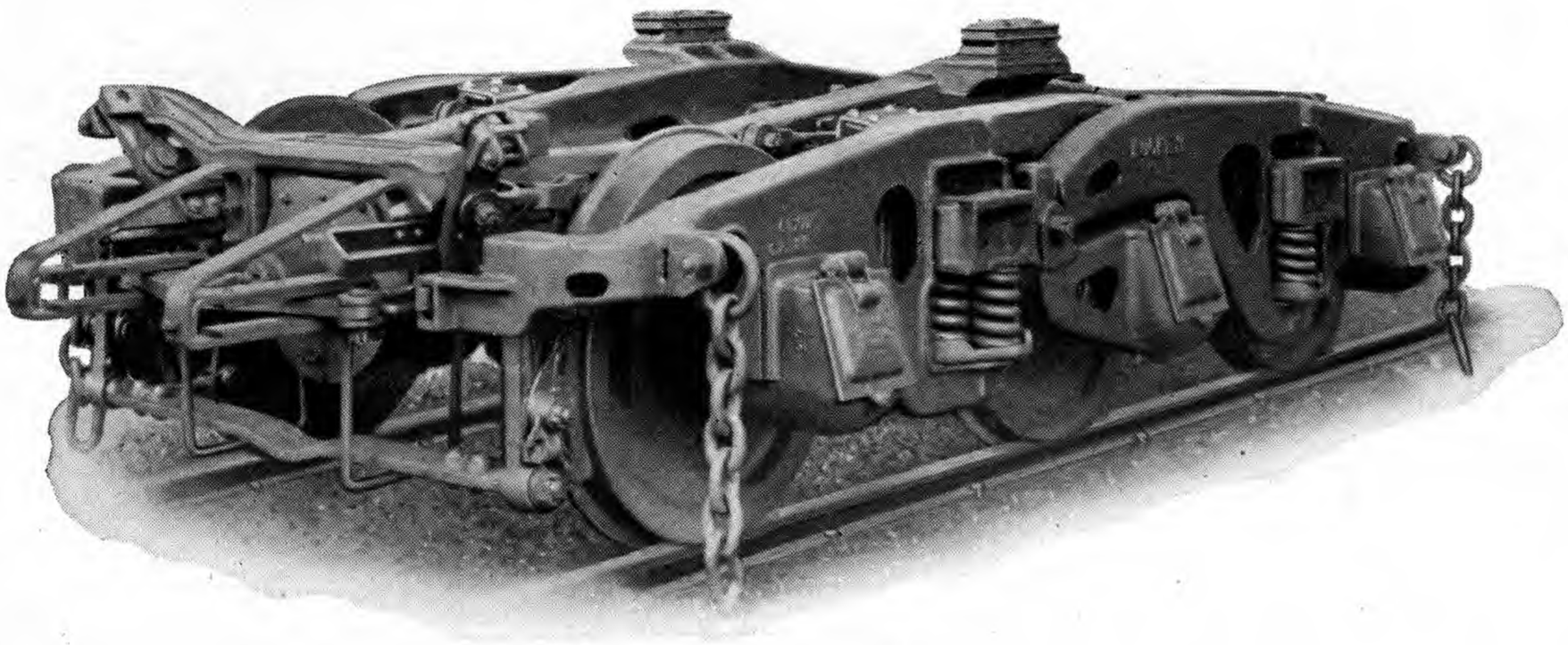


Buckeye Six-Wheel Tender Truck with 7 in. x 14 in. axles and 36 in. wheels, showing Unit Bolster with built-in dampening device at bolster column.

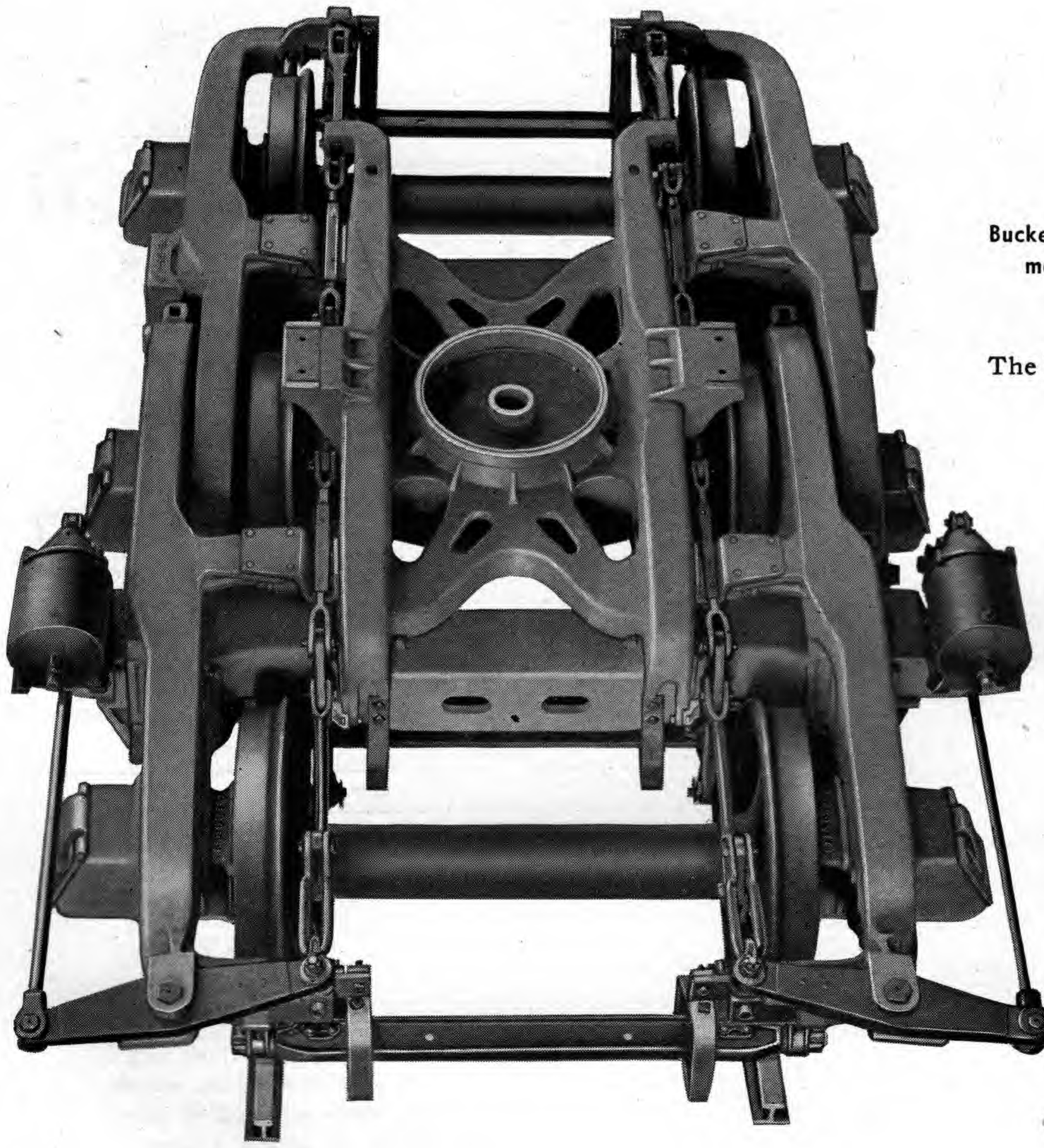
The Buckeye Steel Castings Company



Buckeye Six-Wheel Tender Truck with side-mounted brake cylinders.



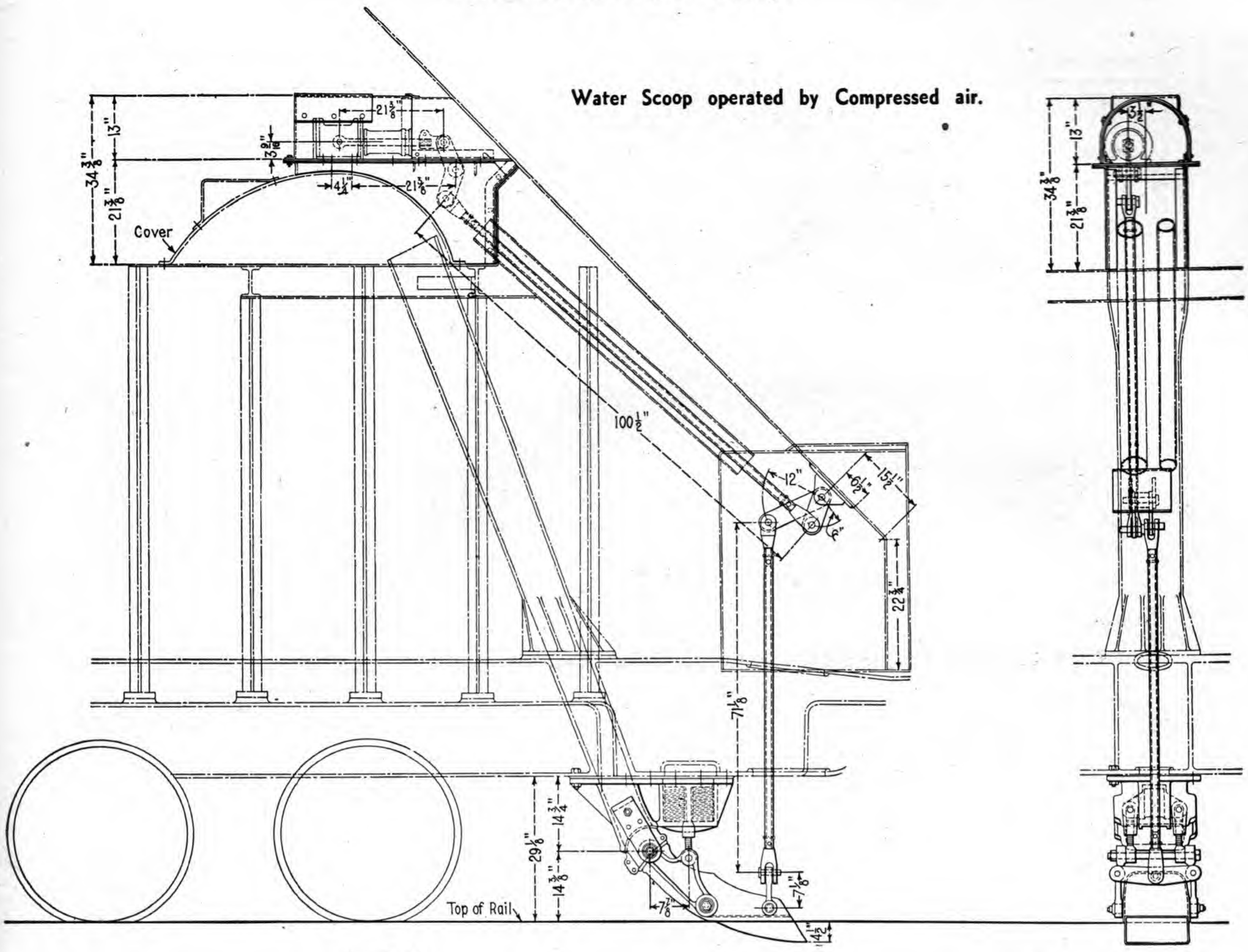
Buckeye Six-wheel Tender Truck with center-mounted brake cylinders.



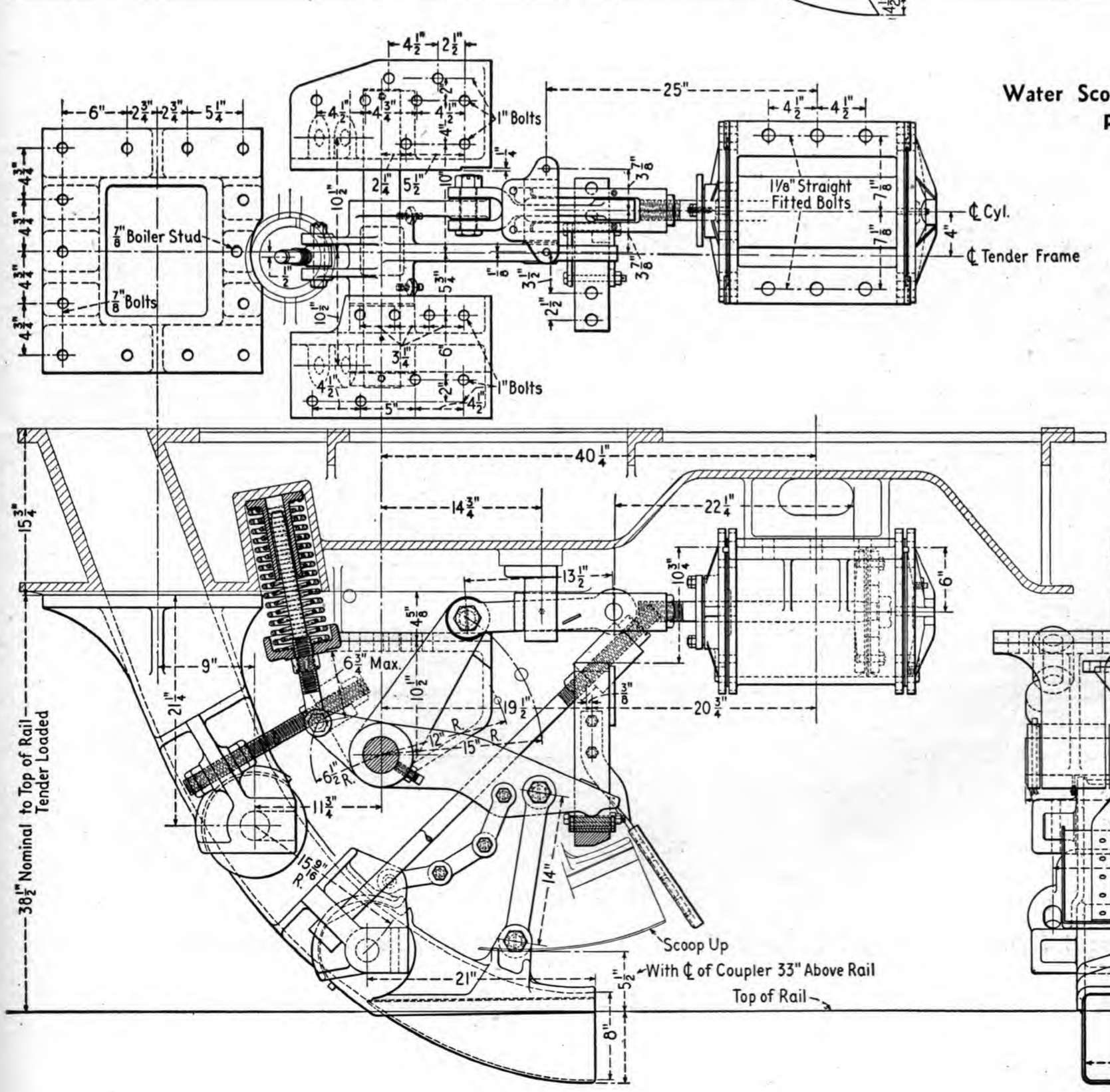
Buckeye Six-Wheel Tender Truck with side-mounted brake cylinders. Top view

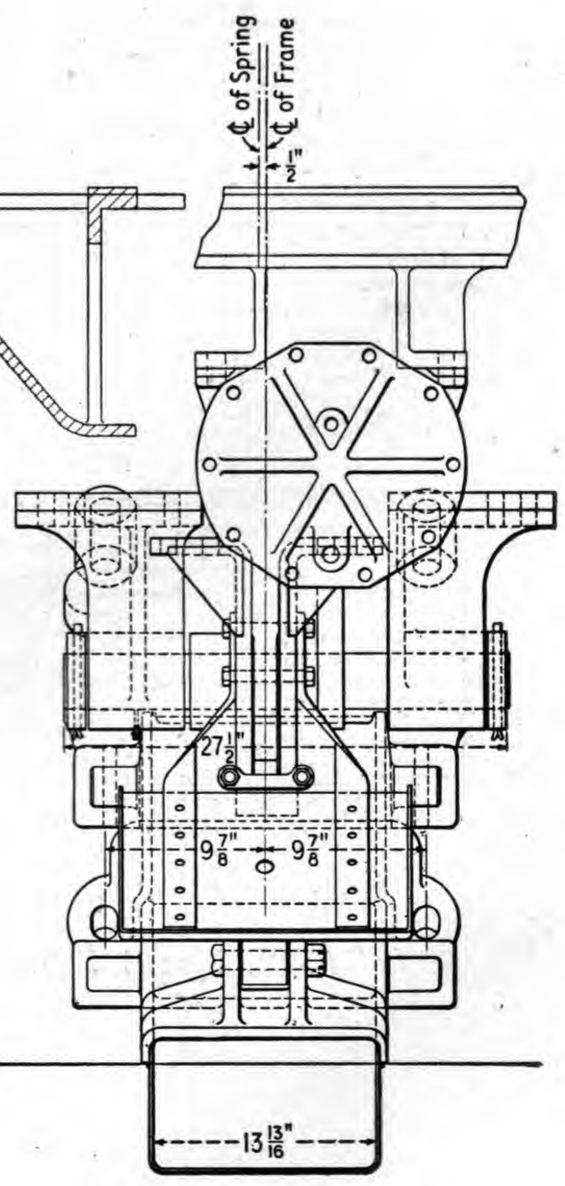
The Buckeye Steel Castings Company

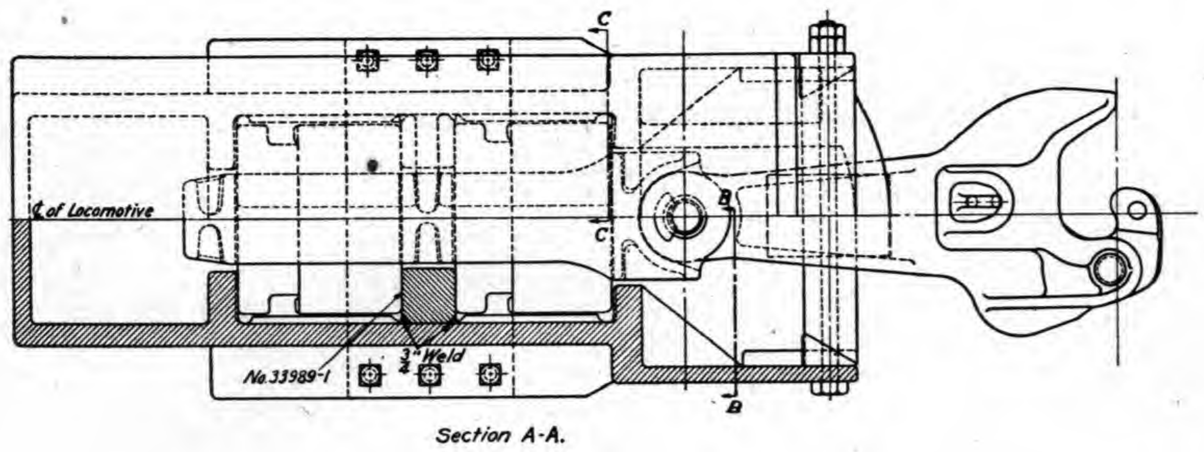
Water Scoop operated by Compressed air.



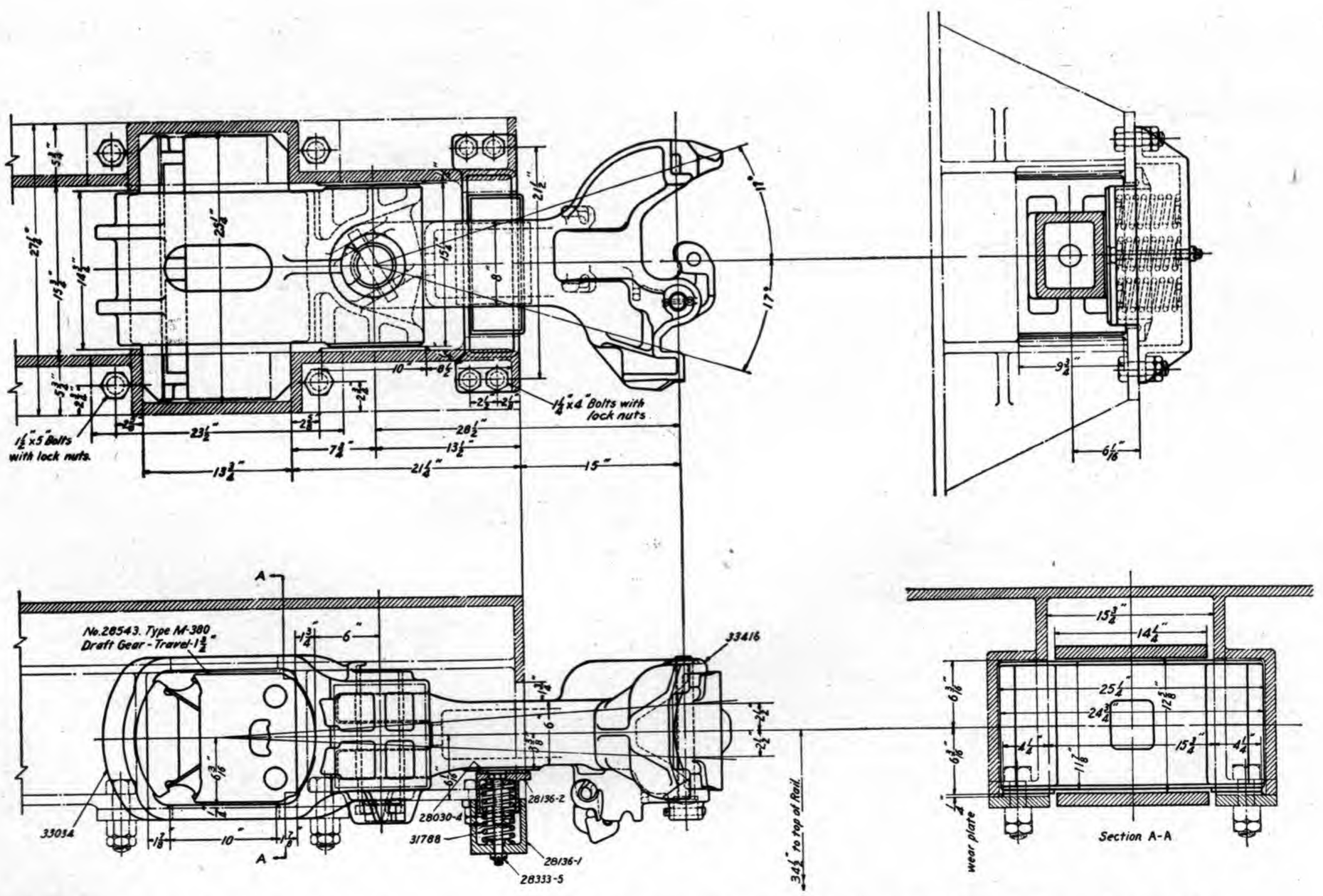
Water Scoop operated by compressed air.





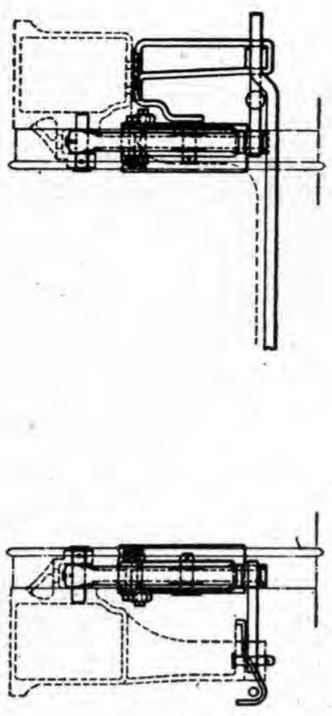


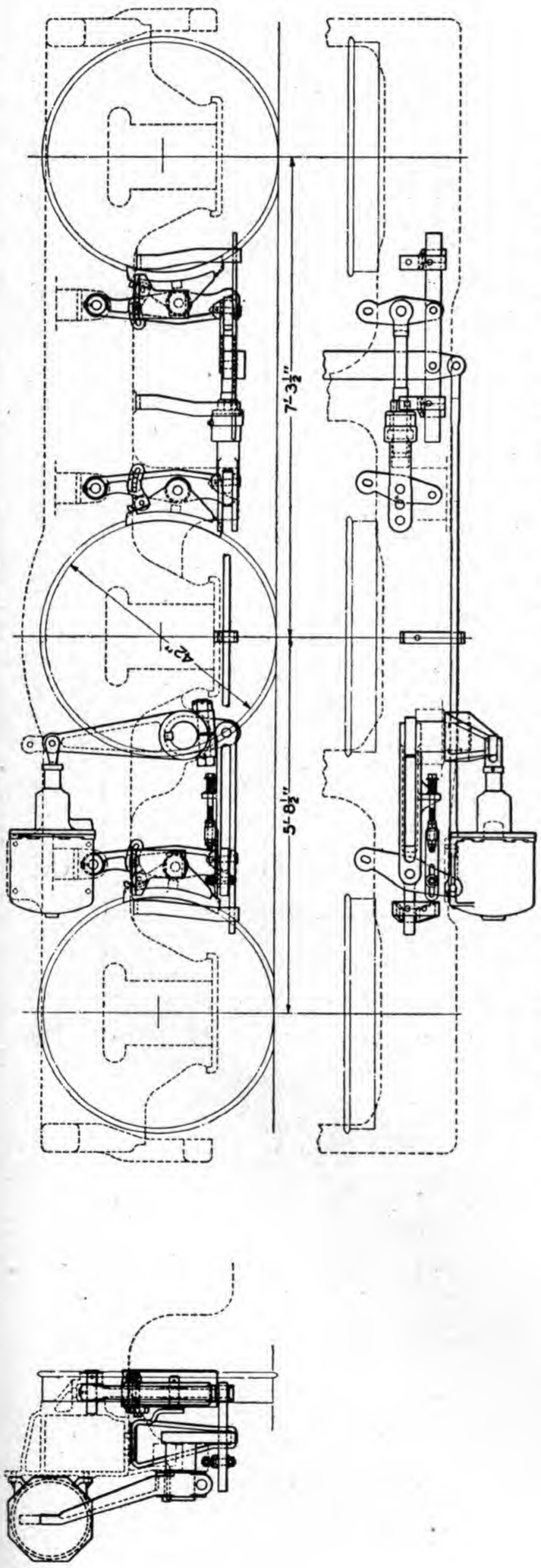
A.A.R. Standard E Coupler and Rubber Cushioned Draft Gear with tandem yoke applied to a locomotive.



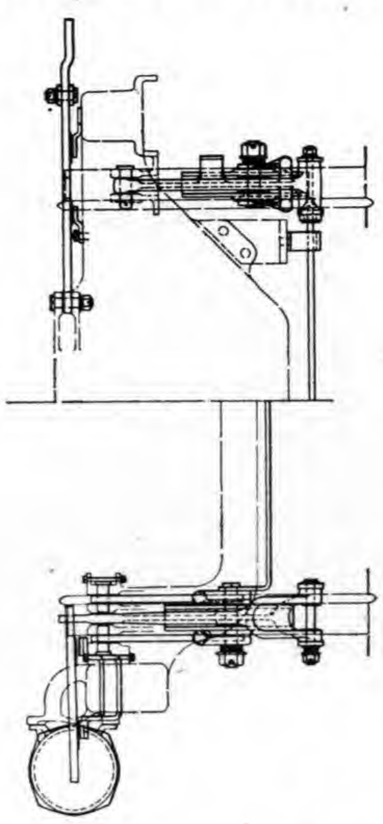
A.A.R. Type H Tightlock Coupler and Rubber Cushioned Draft Gear Type M-30 applied to a locomotive.

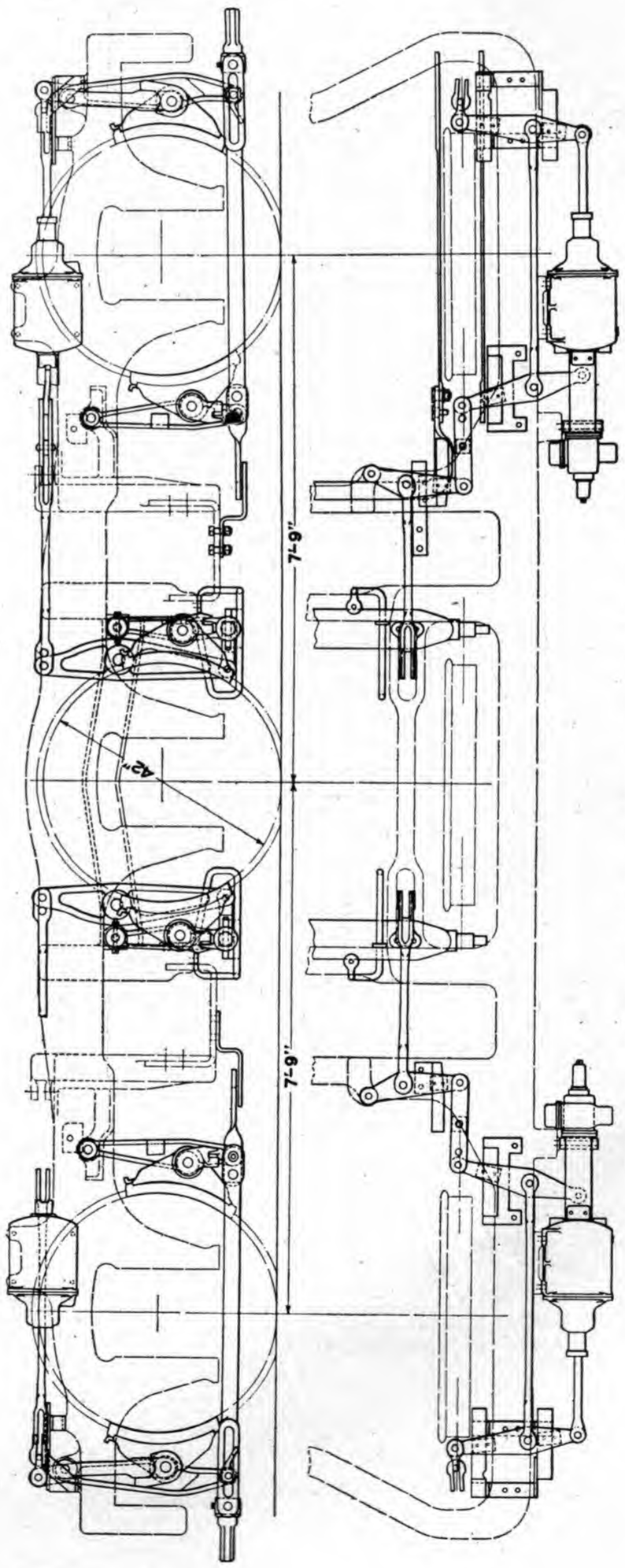
National Malleable and Steel Castings Company





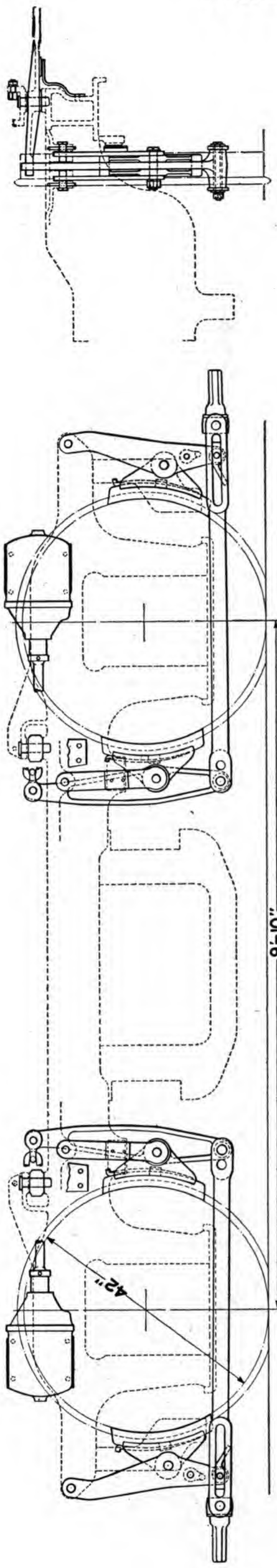
Westinghouse Motor Truck Simple-Shoe Brake for 6-wheel Truck Diesel-electric Road-Transfer Locomotive.



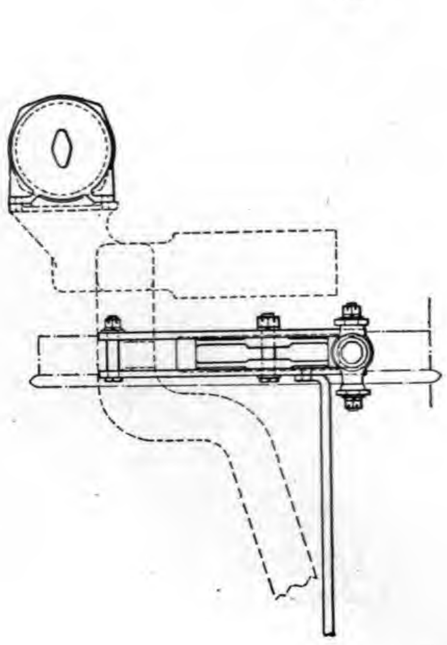


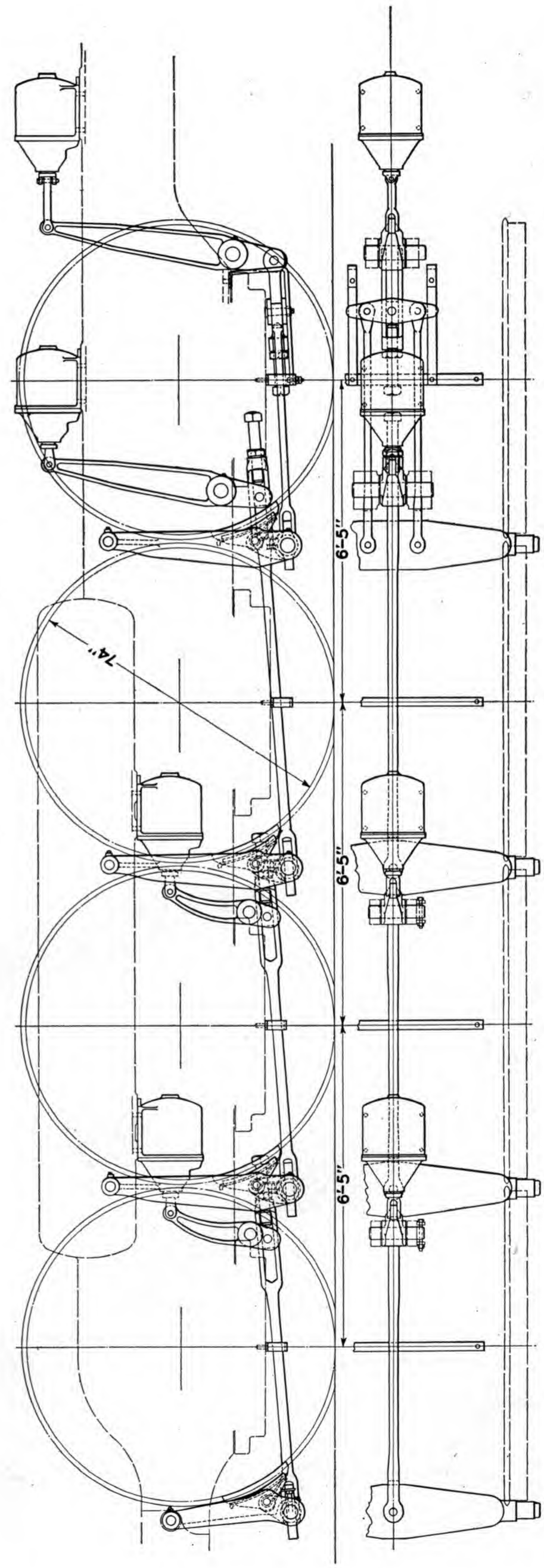
Westinghouse Motor Truck Clasp Brake for 6-wheel Truck Diesel-electric Road Locomotive.

Westinghouse Air Brake Company



Westinghouse Motor Truck Clasp Brake for 4-wheel Truck Diesel-Electric Road Switcher.





Westinghouse Foundation Driver Brake Gear for 4-8-4 Type Steam Locomotive.
Westinghouse Air Brake Company

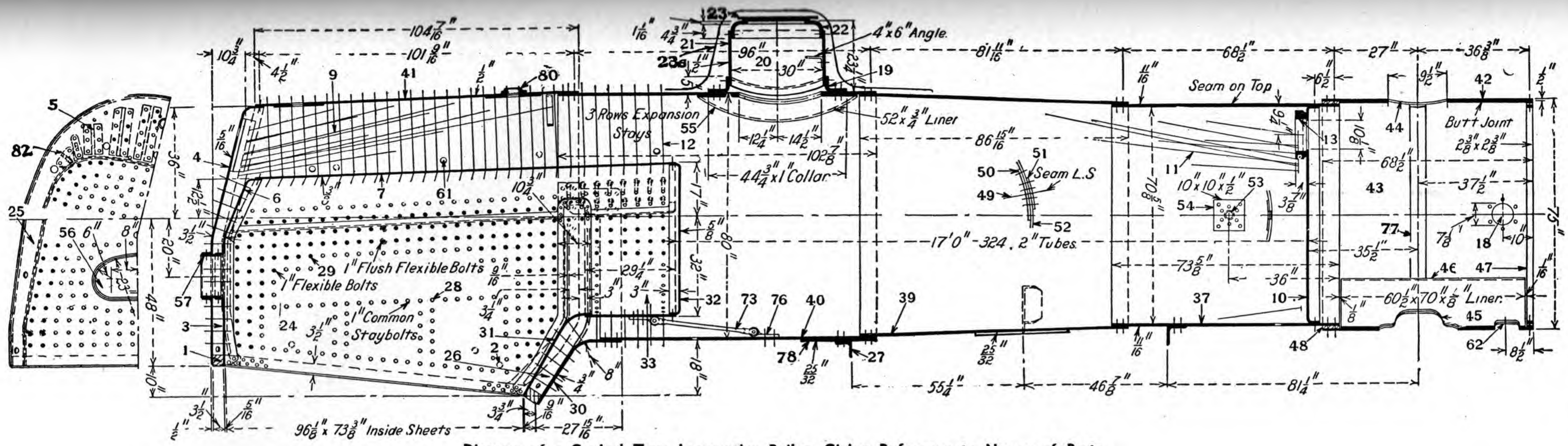
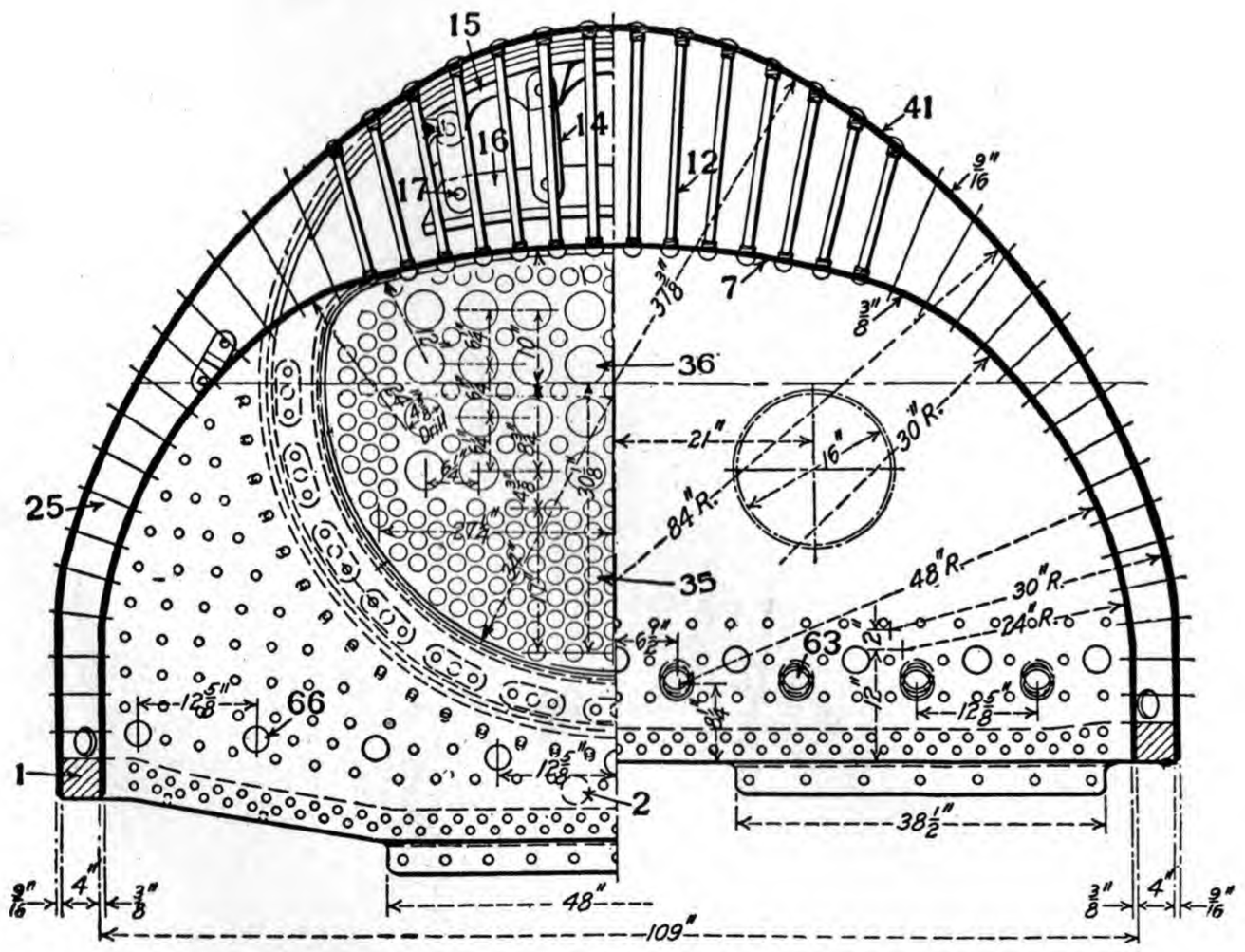

4"x6" Angle.
3 Rows Expansion Stays
52"x3/4" Liner
Seam on Top
Butt Joint 2 3/8" x 2 3/8"
44 1/4" x 1" Collar
Seam L.S
10"x10"x1/2" Liner
17'0" - 324 . 2" Tubes
1" Flush Flexible Bolts
1" Flexible Bolts
1" Common Staybolts
60 1/2" x 70" x 7/8" Liner
96 1/8" x 73 3/8" Inside Sheets

Diagram of a Conical Type Locomotive Boiler, Giving Reference to Names of Parts.

Note: These boilers are not of recent design but still serve for names of parts.

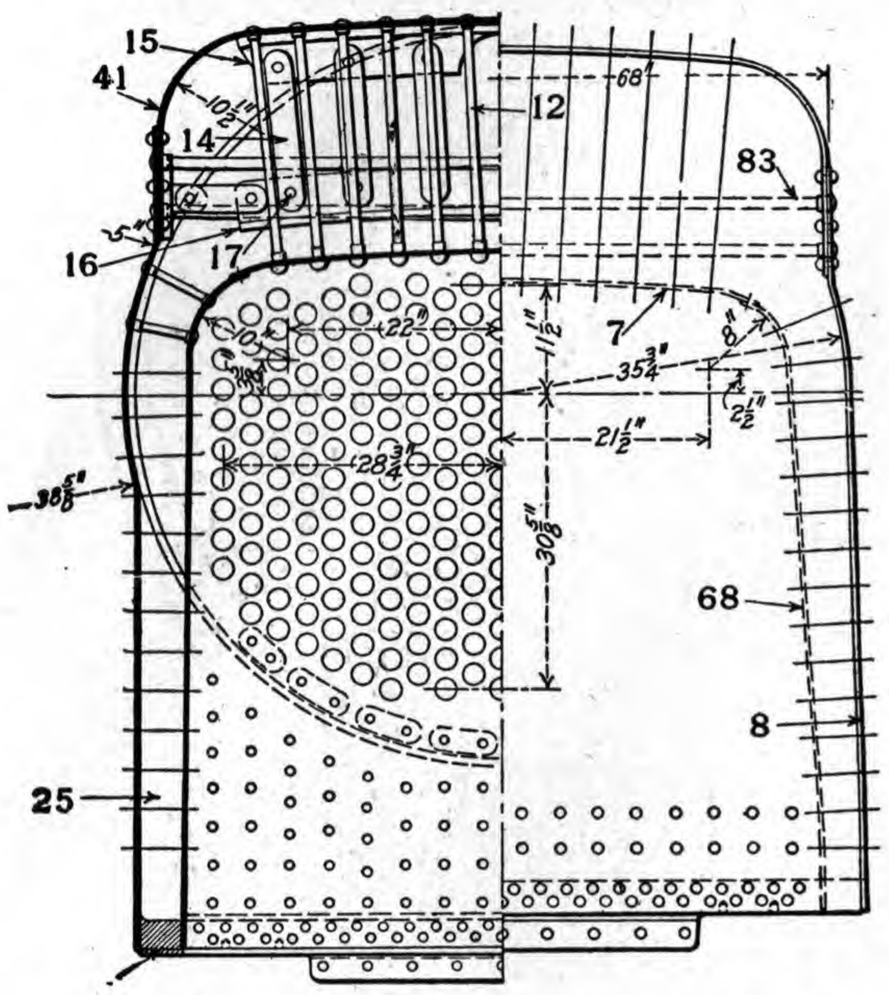


Cross section of a Wootten Type Locomotive Firebox.

Names of Parts of Locomotive Boilers

1 *Foundation or Mudring*
2 *Blowoff Cock Hole*
3 *Back Water Space*
4 *Back-Head*
5 *Back-Head Brace Angle*
6 *Back or Firebox Door sheet*
7 *Crownsheet*
8 *Outside Firebox Sheet (Side Sheet)*
9 *Back-Head Brace*
10 *Front Tube-Sheet*
11 *Front Tube-Sheet Brace*
12 *Radial Stay*
13 *Stiffening or Tube-Sheet Ring for Drypipe*
14 *Sling Stay*
15 *Sling Stay Tee*
16 *Crownbar*
17 *Crownbar Bolt*
18 *Smokebox Cleaning Hole*
19 *Dome Base, Flange or Collar*
20 *Dome*
21 *Dome Shell*
22 *Dome Cap*
23 *Dome Cover*
23a *Dome Casing*
24 *Firebox*
25 *Side Water Space*
26 *Front Water Space*
27 *Waist-Sheet Angle*
28 *Short Staybolt*
29 *Flexible Staybolt*
30 *Throat-Sheet, Outside*
31 *Inside Firebox Throat-Sheet*
32 *Back Tube-Sheet*
33 *Combustion-Chamber*
34 *Throat or Belly-Brace*
35 *Tube (Small)*
36 *Flue (Large) for Superheater Unit*
37 *First Course*
38 *Second Course*
39 *Conical or Gusset Course*
40 *Dome Course*
41 *Roof-Sheet*

(Continued on following page)



Cross section of a Belpaire Type Locomotive Firebox.

Names of Parts of Locomotive Boilers (Cont.)

42 *Smokebox Shell*
43 *Smokebox*
44 *Smokestack Opening*
45 *Steampipe Opening*
46 *Smokebox Bottom Liner*
47 *Smokebox Front Ring*
48 *Smokebox and Shell Ring*
49 *Longitudinal Seam*
50 *Inside Welt*
51 *Outside Welt*
52 *Shell-Plate*
53 *Check-Valve Hole*
54 *Check-Valve Hole Pad or Liner*
55 *Dome Liner*
56 *Firedoor Hole*
57 *Firedoor Hole Ring*
58 *Arch-Tube*
59 *Arch-Tube Plug*
60 *Brick Arch*
61 *Washout Plug Hole*
62 *Cinder Valve Hole*
63 *Grate-Bar Thimble*
64 *Dash-Plate*
65 *Drypipe Hanger*
66 *Grate Water-Tubes*
67 *Washout Plug Hole Flange*
68 *Firebox Side-Sheet*
69 *Combustion-Chamber Course*
70 *Safety-Valve Dome or Turret*
71 *Safety-Valve Turret Swash-Plate*
72 *Injector Delivery-Pipe Hanger*
73 *Combustion-Chamber Brace*
74 *Belly Washout Hole*
75 *Belly Washout Hole Flange*
76 *Boiler Brace Foot*
77 *Smokebox Joint Ring*
78 *Waist-Sheet Angle Line*
79 *Water-Gage Cock Hole*
80 *Whistle Flange*
81 *Gusset Stay*
82 *Crowfoot*
83 *Boiler Cross Brace*

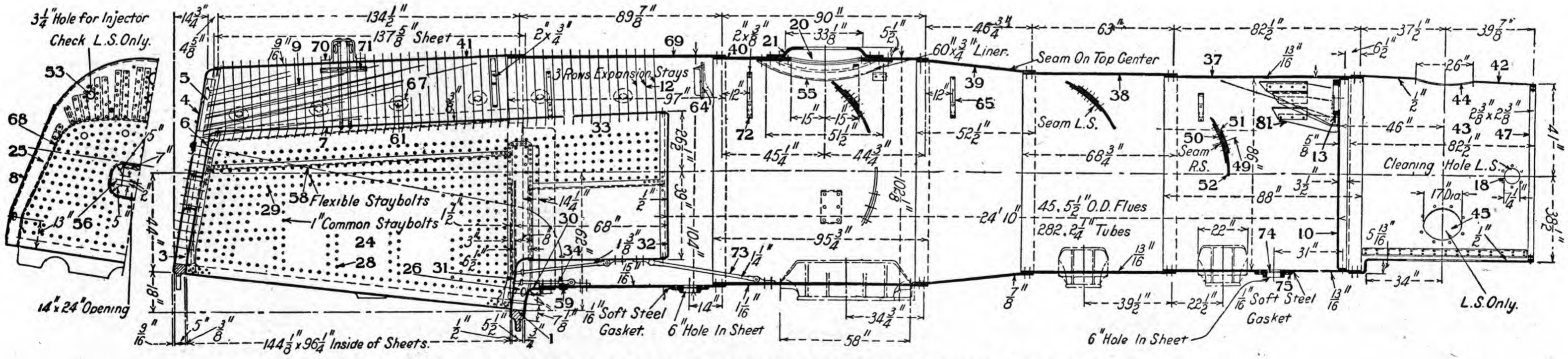
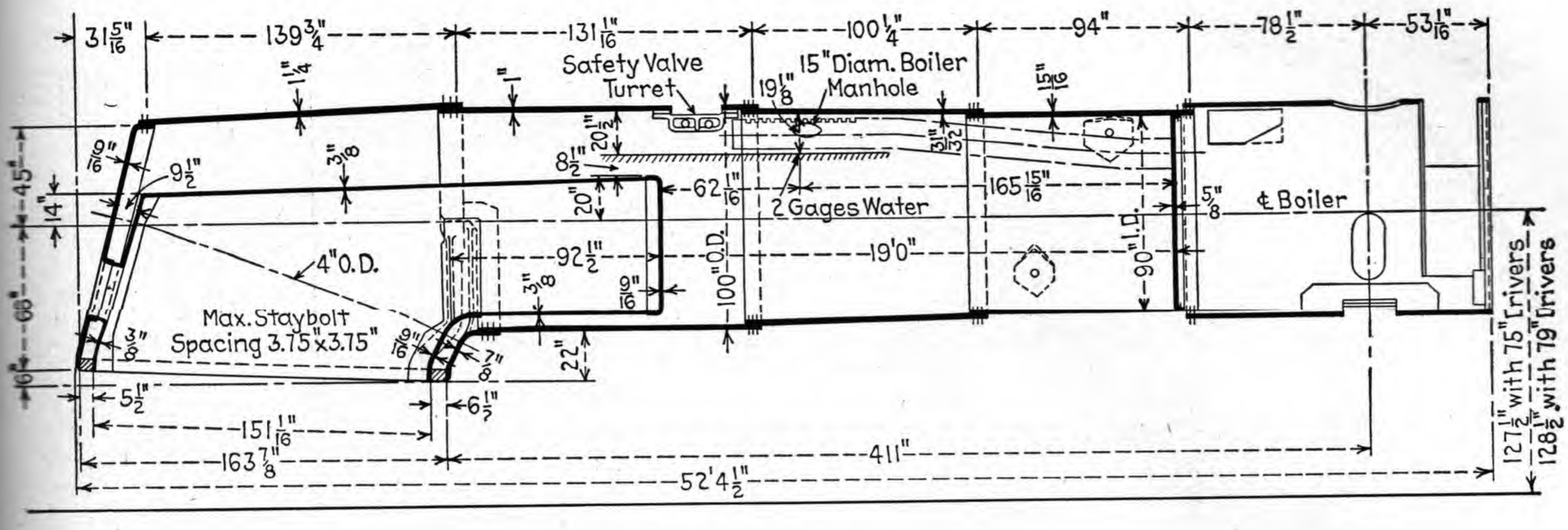
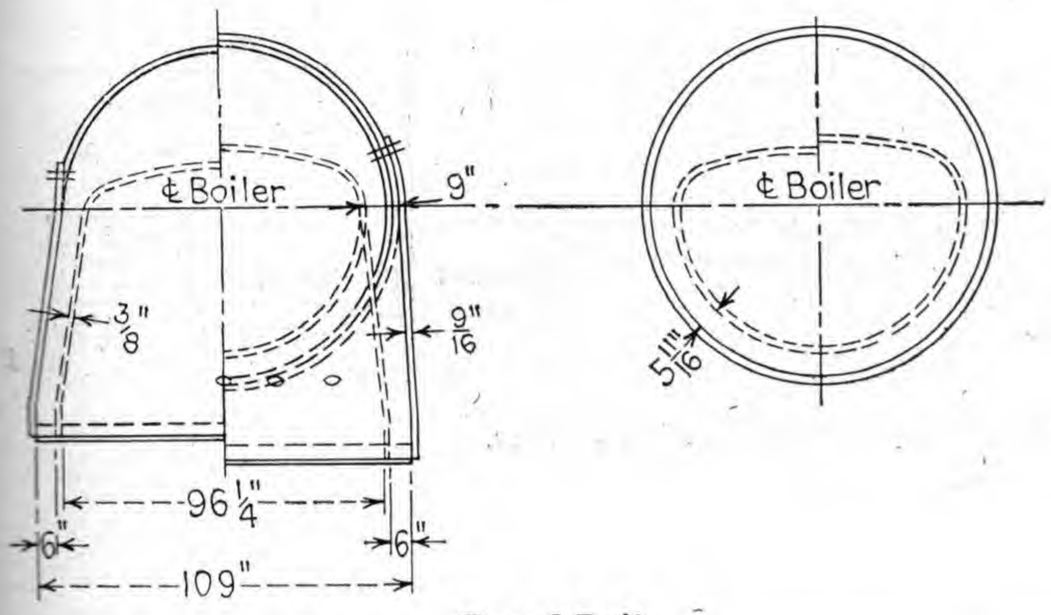


Diagram of an Extended Wagon-Type Locomotive Boiler, Giving References to Names of Parts.

Note: These boilers are not of recent design but still serve for names of parts.

BOILERS: Diagram, N. Y. C., 4-8-4 Type



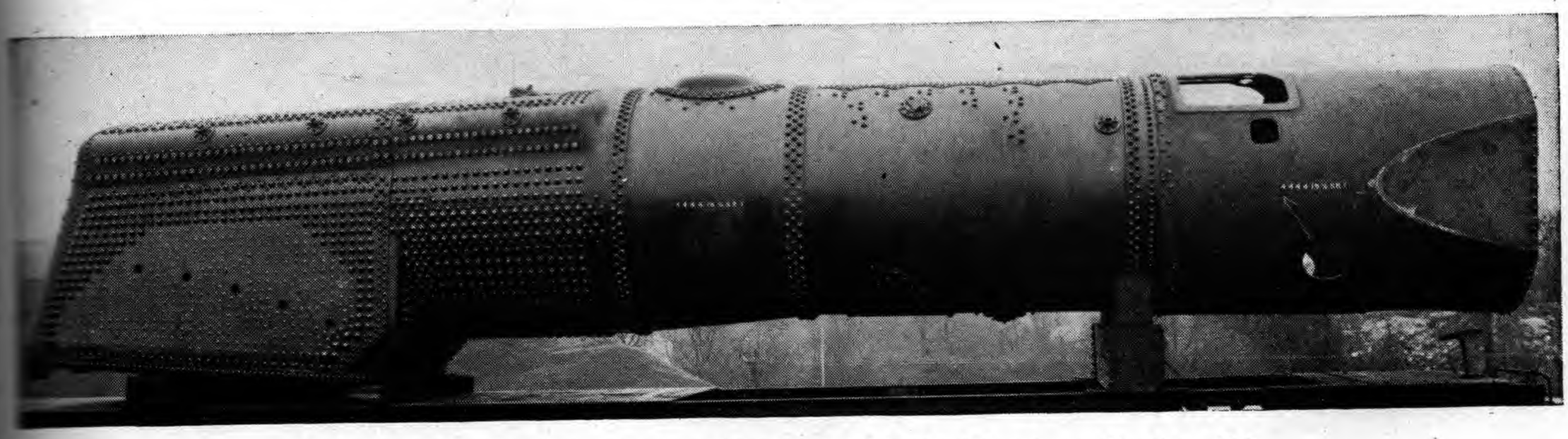


Top of Rail

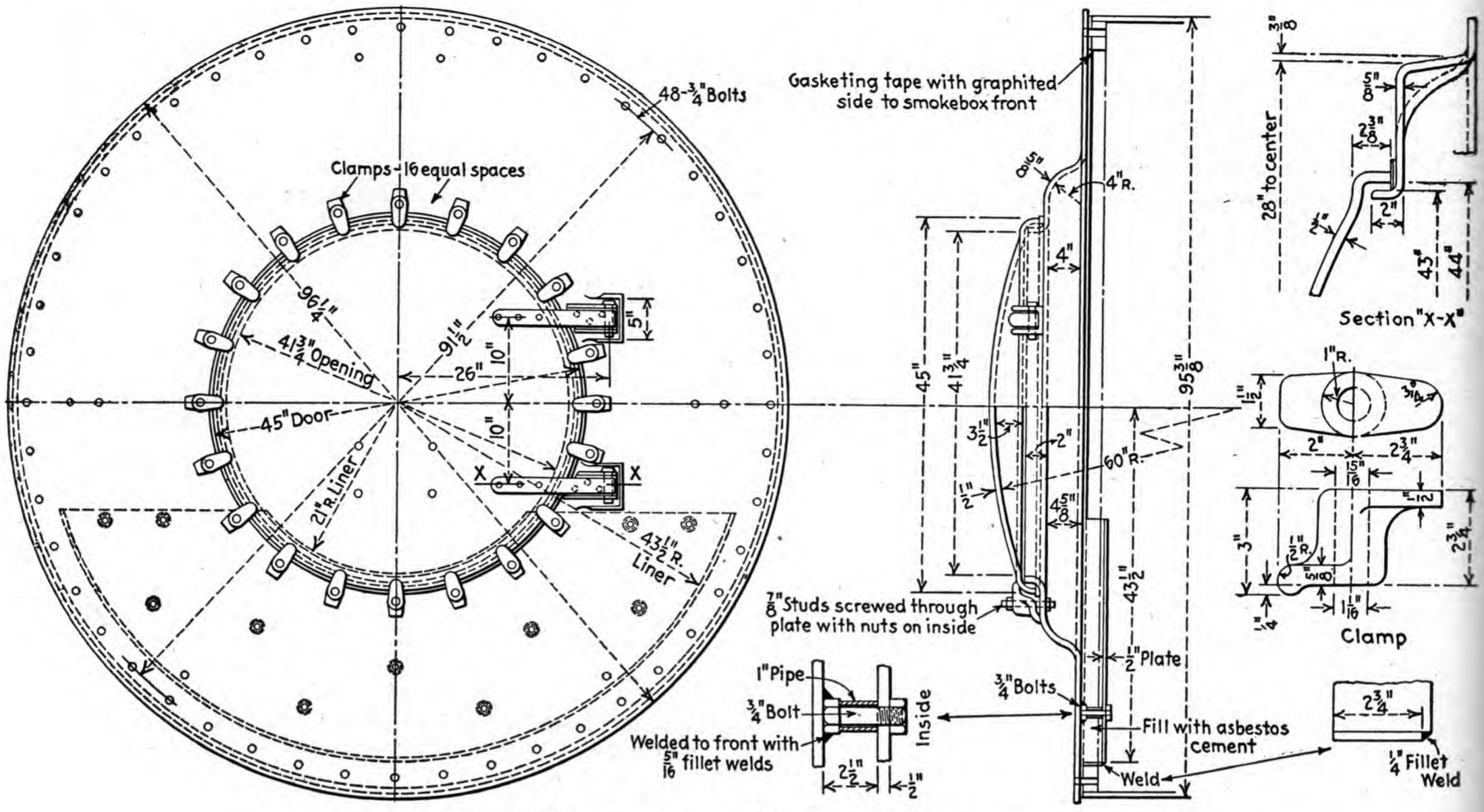
Diagram and data of the domeless boiler for New York Central 4-8-4 Type Locomotive, Class S-1a, Road Nos. 6,000- 6,025.

Description: *Railway Mechanical Engineer,* October, 1945; *Railway Age,* September 22, 1945.

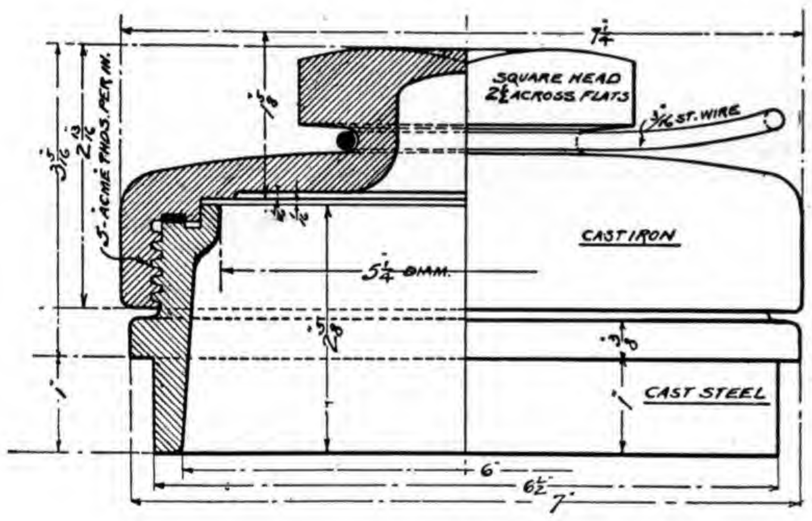
Steam pressure, lb.	275
Diameters, in.:	
First ring, inside, in.	90
First ring, outside, in.	96 1/8
Second ring, outside, in.	98 1/8
Third ring, inside, in.	98 1/8
Third ring, outside, in.	100
Sheet thicknesses, in.:	
Smokebox	3/4
First ring	15/16
Second ring	31/32
Third ring	1
Back head	9/16
Side sheets	9/16
Roof sheet	1 1/4
Furnace door sheet	3/8
Furnace side sheets	3/8
Furnace crown sheet	3/8
Combustion chamber	3/8
Front tube sheet	5/8
Back tube sheet	9/16
Firebox, water spaces:	
Firebox length, in.	151 1/16
Firebox width, in.	96 1/4
Water space, front, in.	6 1/2
Water space, back, in.	5 1/2
Water space, sides, in.	6
Combustion chamber length, in.	98 1/2
Arch tubes, number and diameter	5—4
Tubes, number and diameter	55—2 1/4, 11 B.W.G.
Flues, number and diameter	177—4, 9 B.W.G.
Length over tube sheets, ft.-in.	19—0
Net gas area through tubes and flues, sq. ft.	10.57
Superheater, type	E
Fuel	Bit. coal
Grate area, sq. ft.	100
Grates	Firebar
Stoker, type	Standard HT
Feedwater heater, type	Worthington, 7SA
Heating surfaces, sq. ft.	
Firebox and comb. chamber	442
Arch tubes	57
Firebox, total	499
Tubes and flues	4,320
Evaporative, total	4,819
Superheating	2,073
Comb. evap. and superheat.	6,892
Boiler proportions:	
Firebox heat. surf. per cent comb. heat. surf.	7.25
Tube-flue heat. surf. per cent comb. heat. surf.	62.7
Superheat. surf. per cent comb. heat. surf.	30.0
Firebox heat. surf. ÷ grate area	4.99
Tube-flue heat. surf. ÷ grate area	43.2
Superheat. surf. ÷ grate area	20.7
Comb. heat. surf. ÷ grate area	68.9
Gas area ÷ grate area	0.106
Evap. heat. surf. ÷ grate area	48.19
Tractive force ÷ grate area	615.0
Weight of engine ÷ comb. heat. surf.	68.4
Tractive force ÷ comb. heat. surf.	8.93
Tractive force × diam. drivers ÷ comb. heat. surf.	706



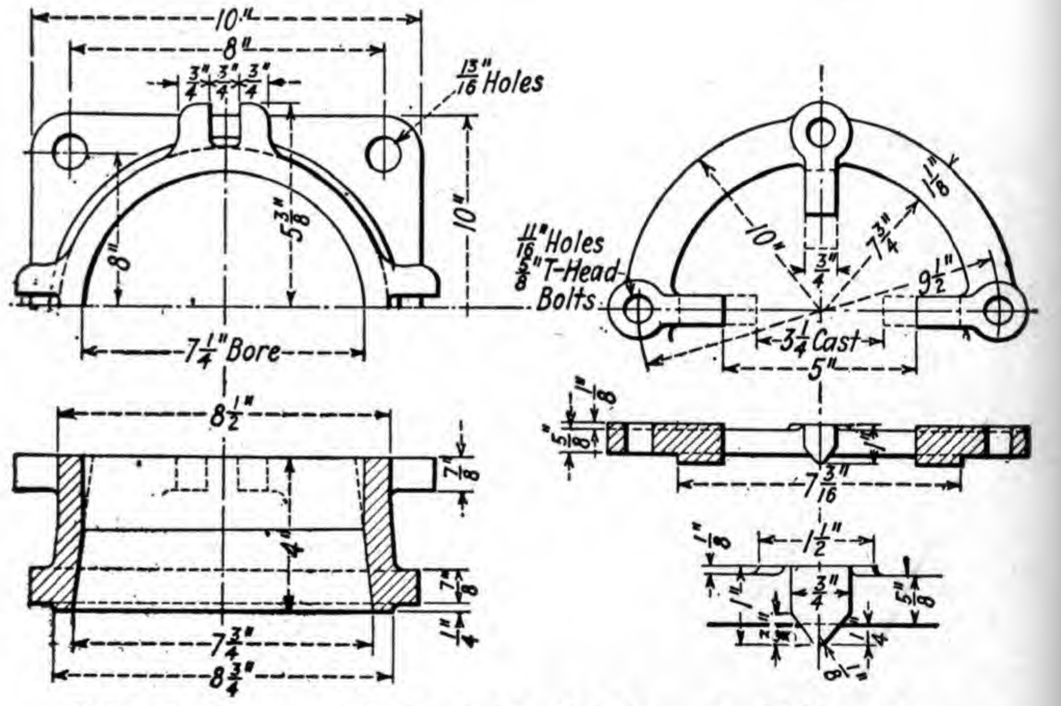
Boiler with Belpaire Firebox for Pennsylvania 4-4-4-4 Duplex Type Locomotive Class T-1.



Smokebox Front and Door for Bessemer & Lake Erie 2-10-4 Type Locomotives.



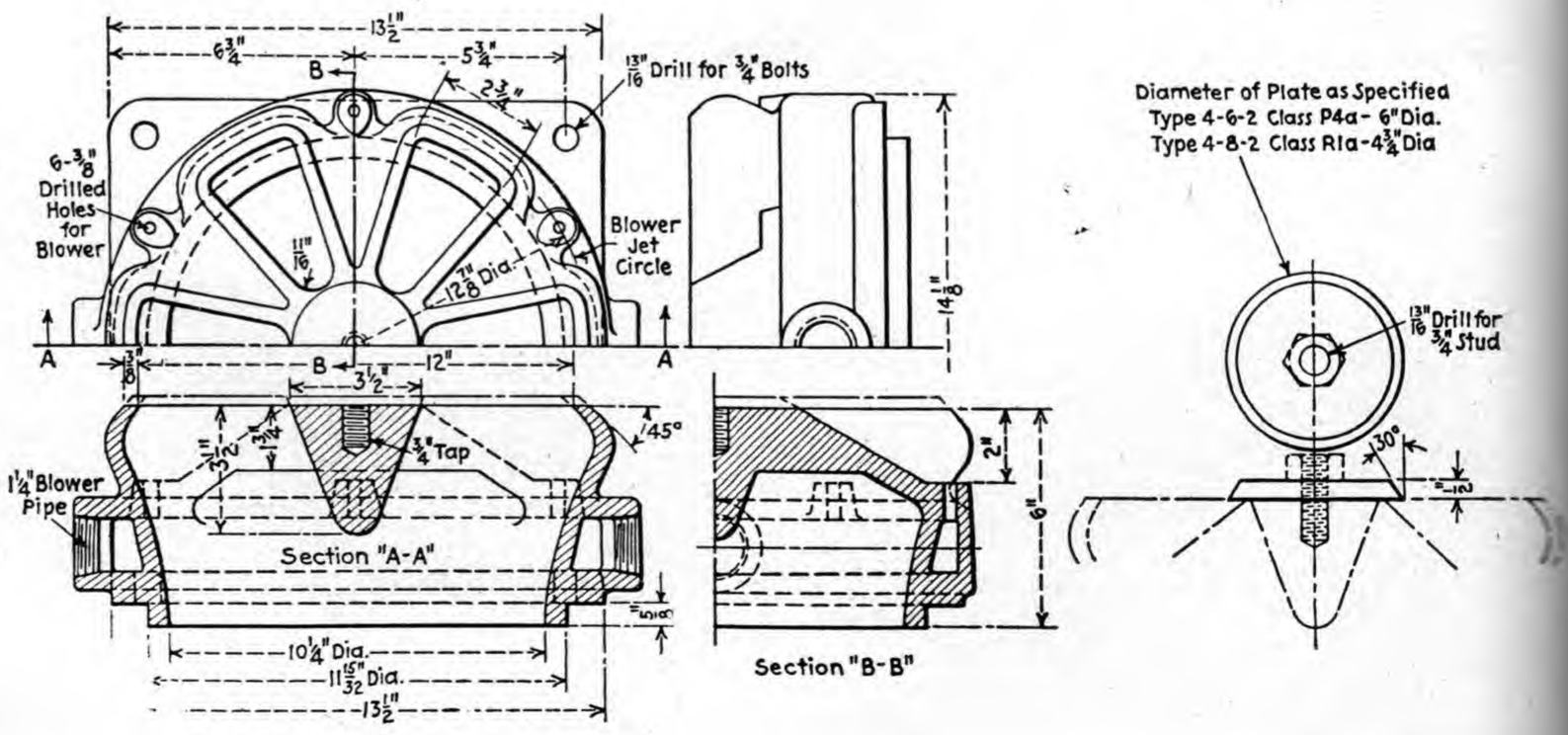
T-Z Inspection Plug for Smokeboxes.
T-Z Railway Equipment Co.

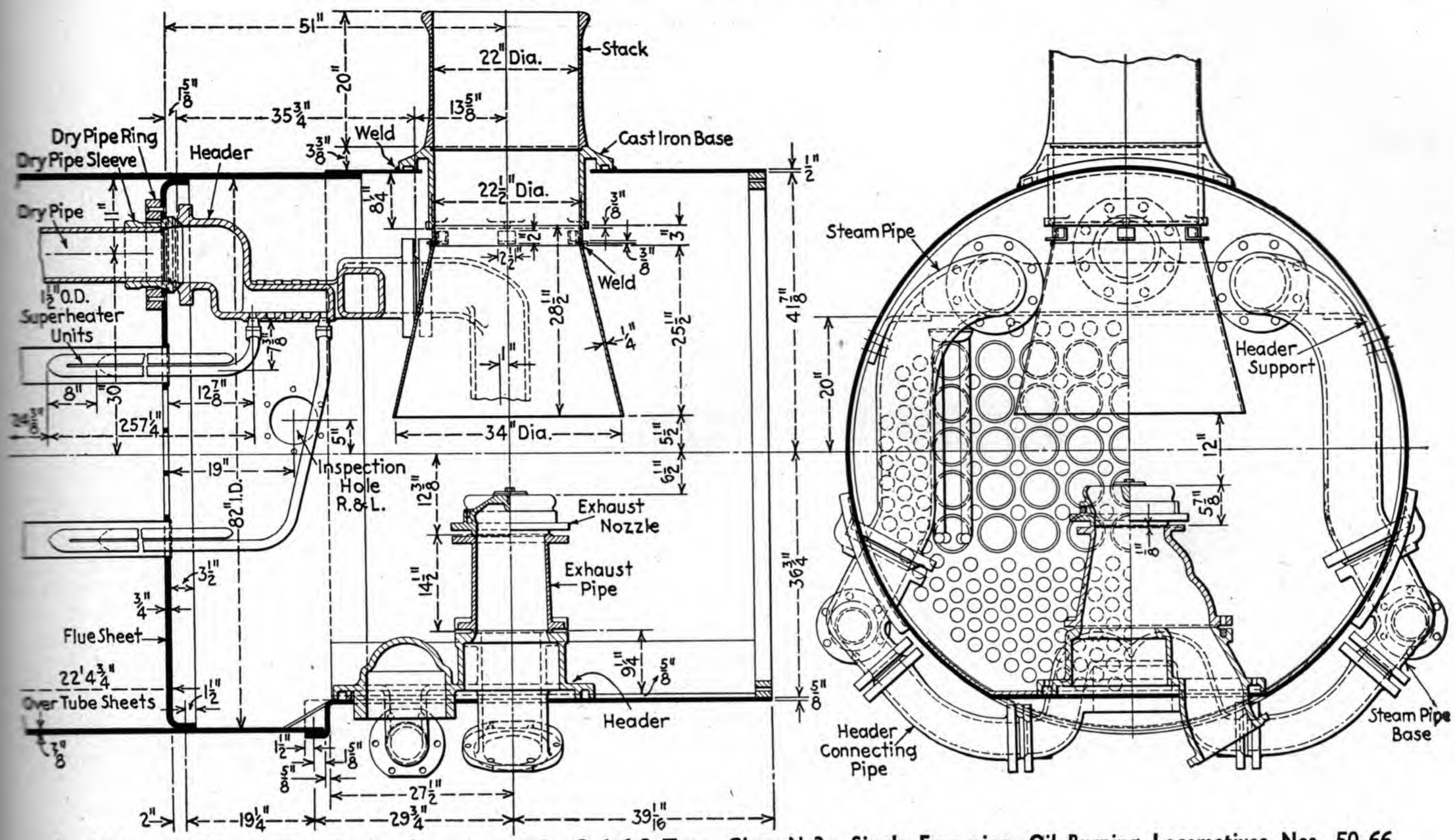


Exhaust Nozzle with Break-Up Wedges, Goodfellow Type.

Multiple-Ported Exhaust Nozzle and Adjusting Cover Plates on Boston & Maine Locomotives.

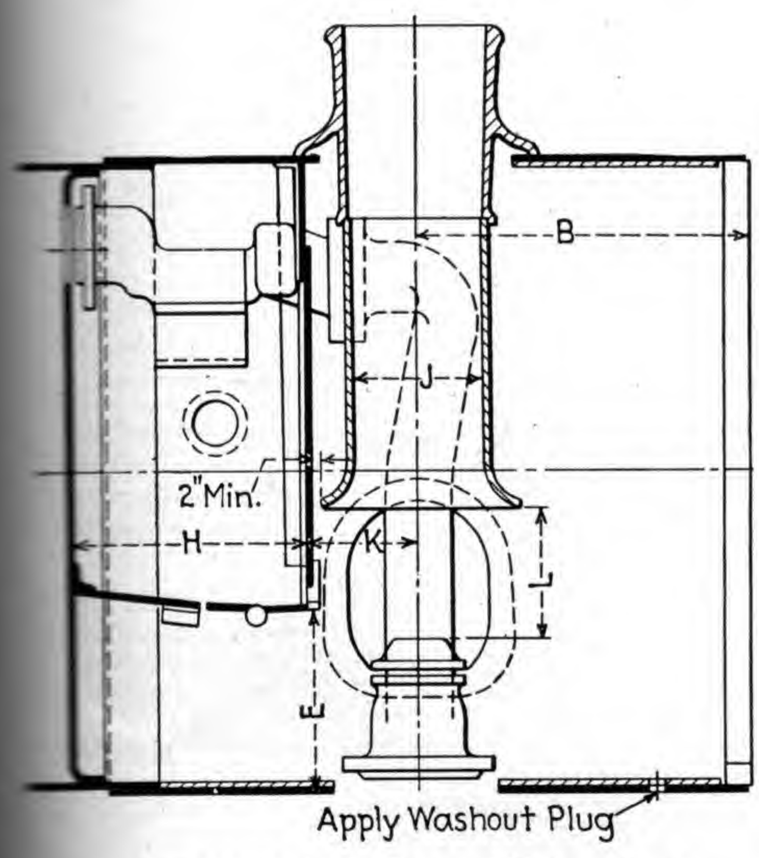
Free Area of Ports 48.07 sq. in.



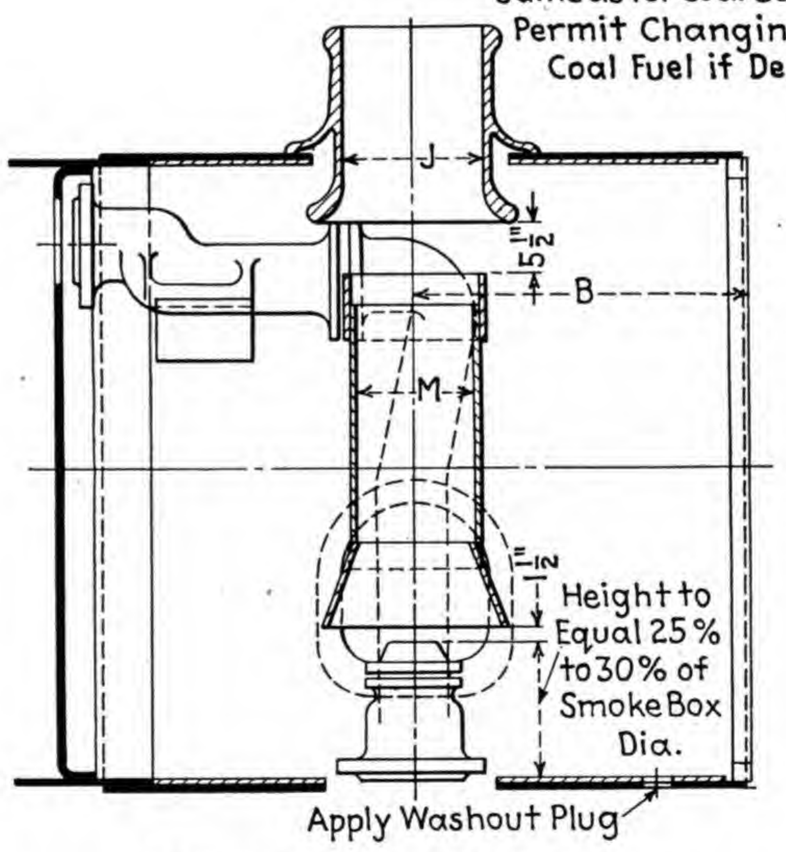


Smokebox and Type A Superheater Arrangement for 2-6-6-2 Type, Class N-3s. Single-Expansion, Oil-Burning Locomotives Nos. 50-66. Chicago, Milwaukee, St. Paul & Pacific.

Make B (Length of Front End) same as for Coal Burning to Permit Changing over to Coal Fuel if Desired.



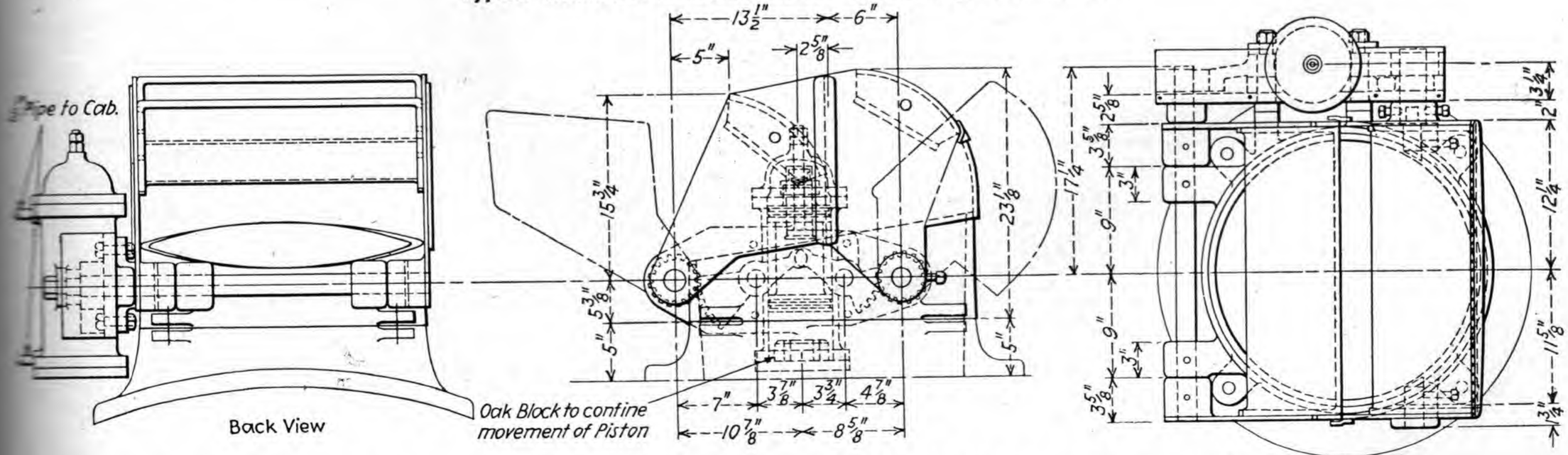
Superheated Steam Oil Burning



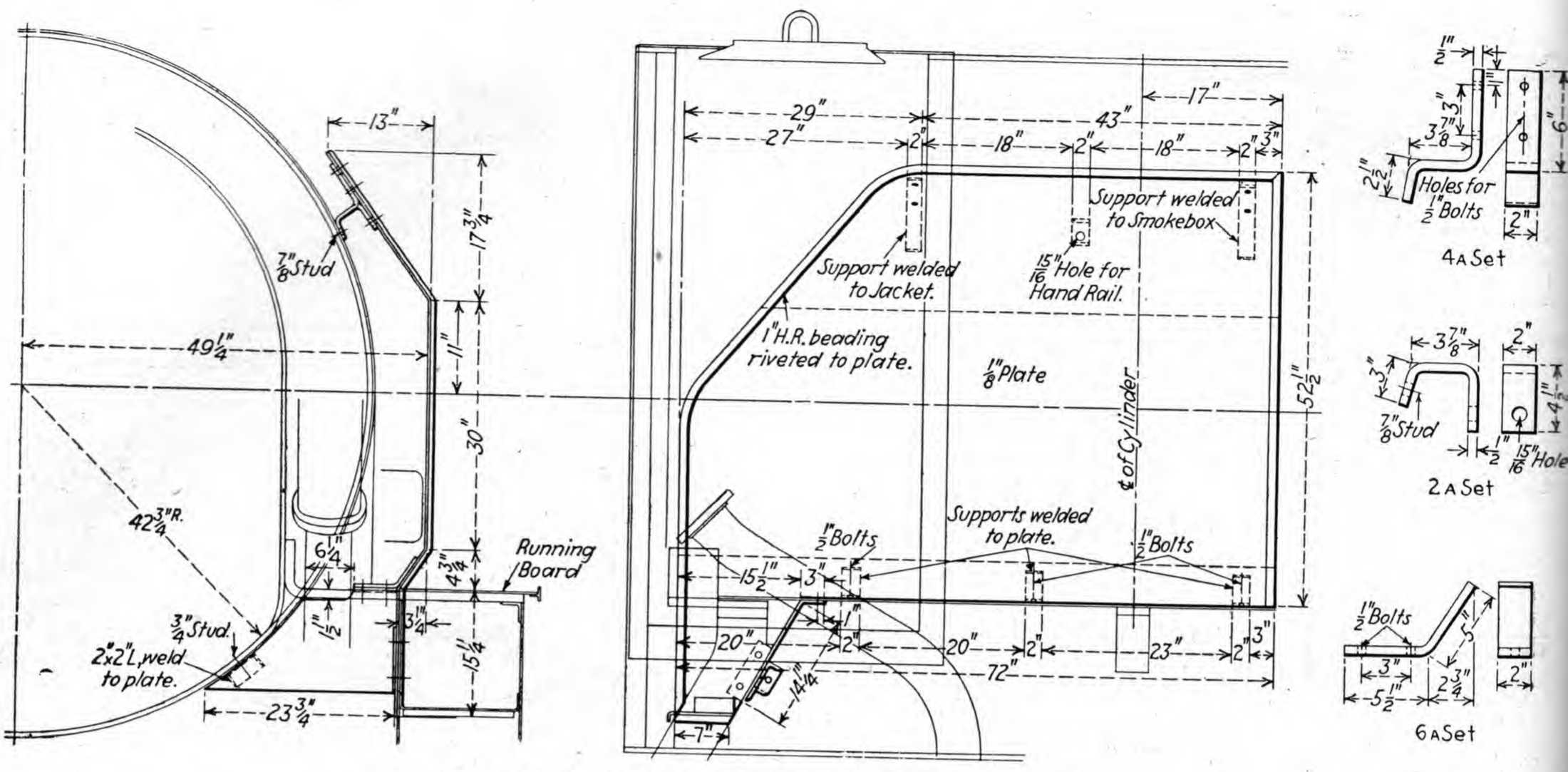
Saturated Steam Oil Burning

	Standard Cast Iron Stack Extention		
M	L	K	J Dia.
9"	13"	11"	11"
10"	13"	12"	12"
11"	14"	12"	13"
12"	14"	13"	14"
13"	15"	13"	15"
14"	15"	14"	16"
15"	16"	14"	17"
16"	16"	15"	18"
17"	17"	15"	19"
18"	17"	16"	20"
	18"	16"	21"
	18"	17"	22"
	19"	17"	23"
	19"	18"	24"

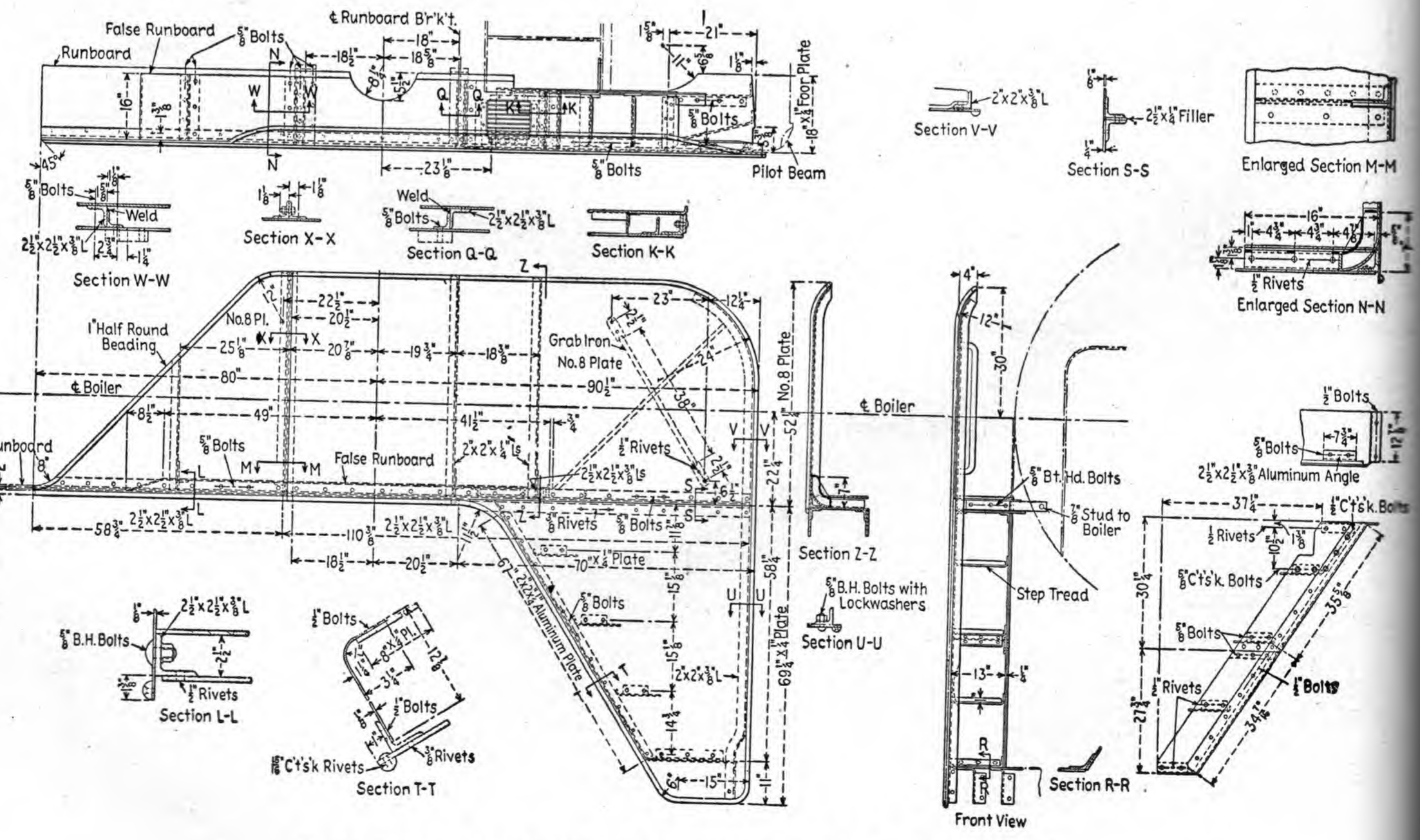
Typical Smokebox arrangements for Oil-Burning Locomotives.



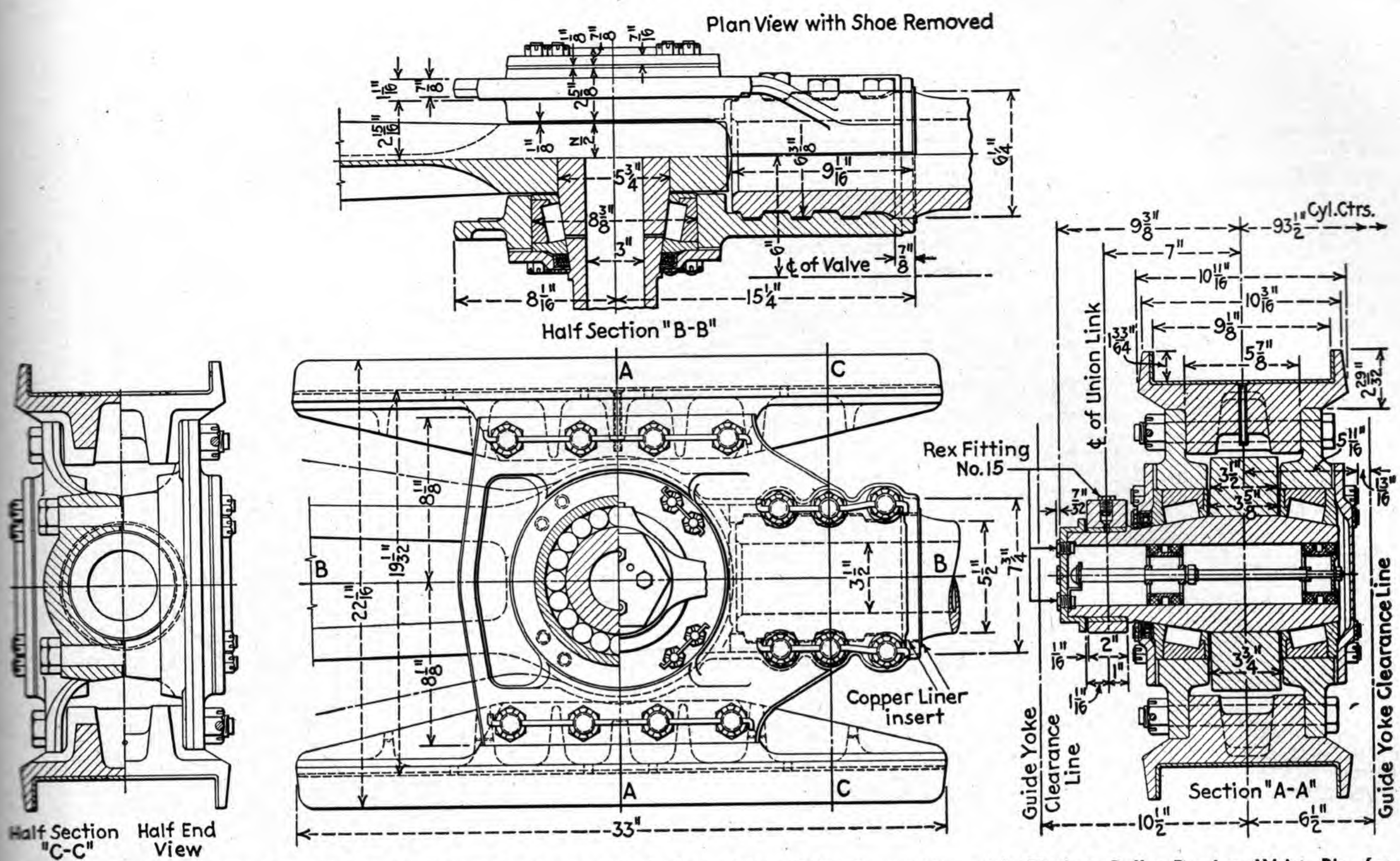
Smoke Deflector for 2-10-2 and 4-10-2 Type Locomotives, used to keep smoke and steam out of cab in tunnels. Southern Pacific Lines.



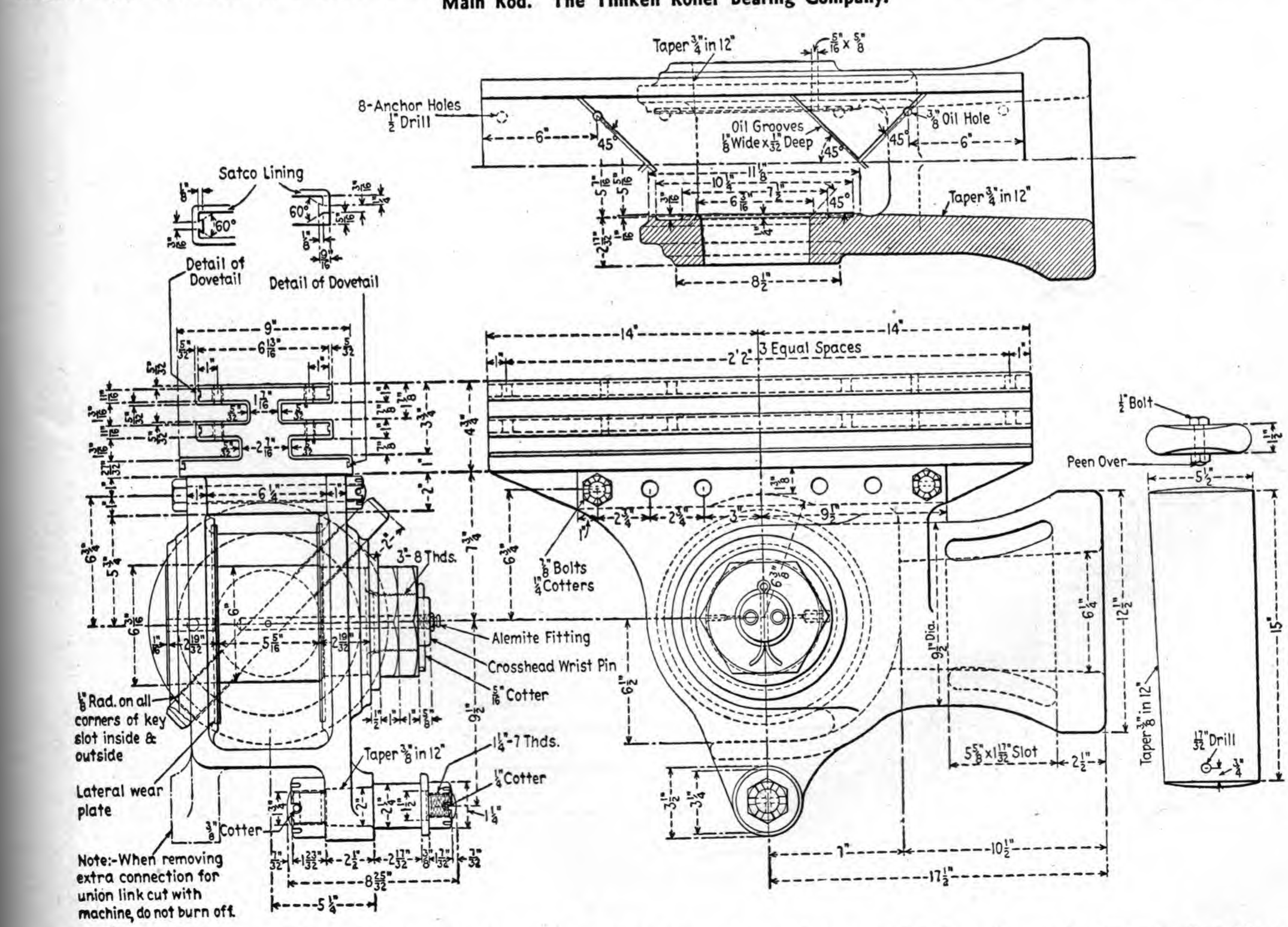
Smoke Deflector, Boston & Maine 4-8-2 Type Locomotives.



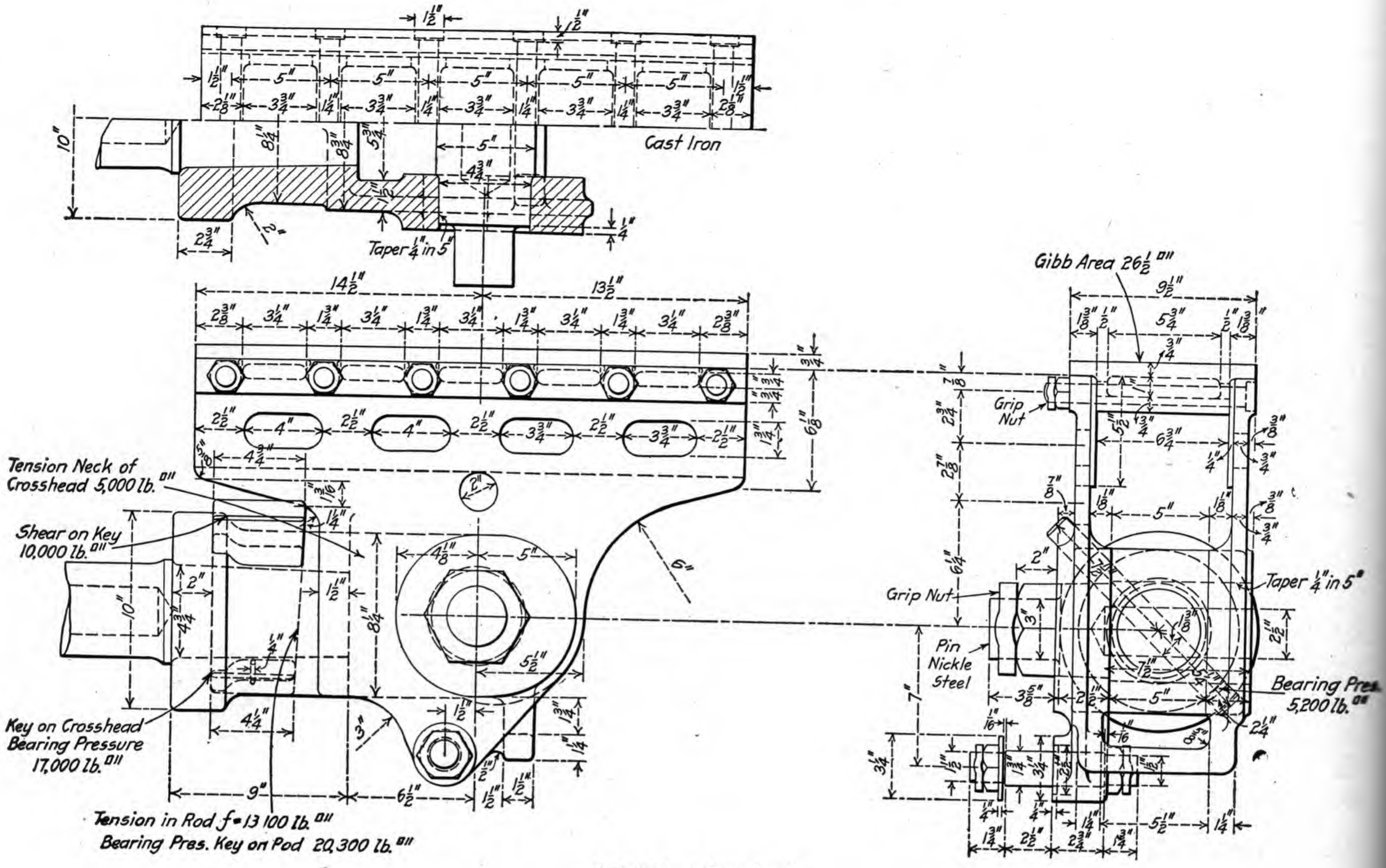
Smoke Deflector (right side) for New York Central 4-8-4 Type Locomotives.



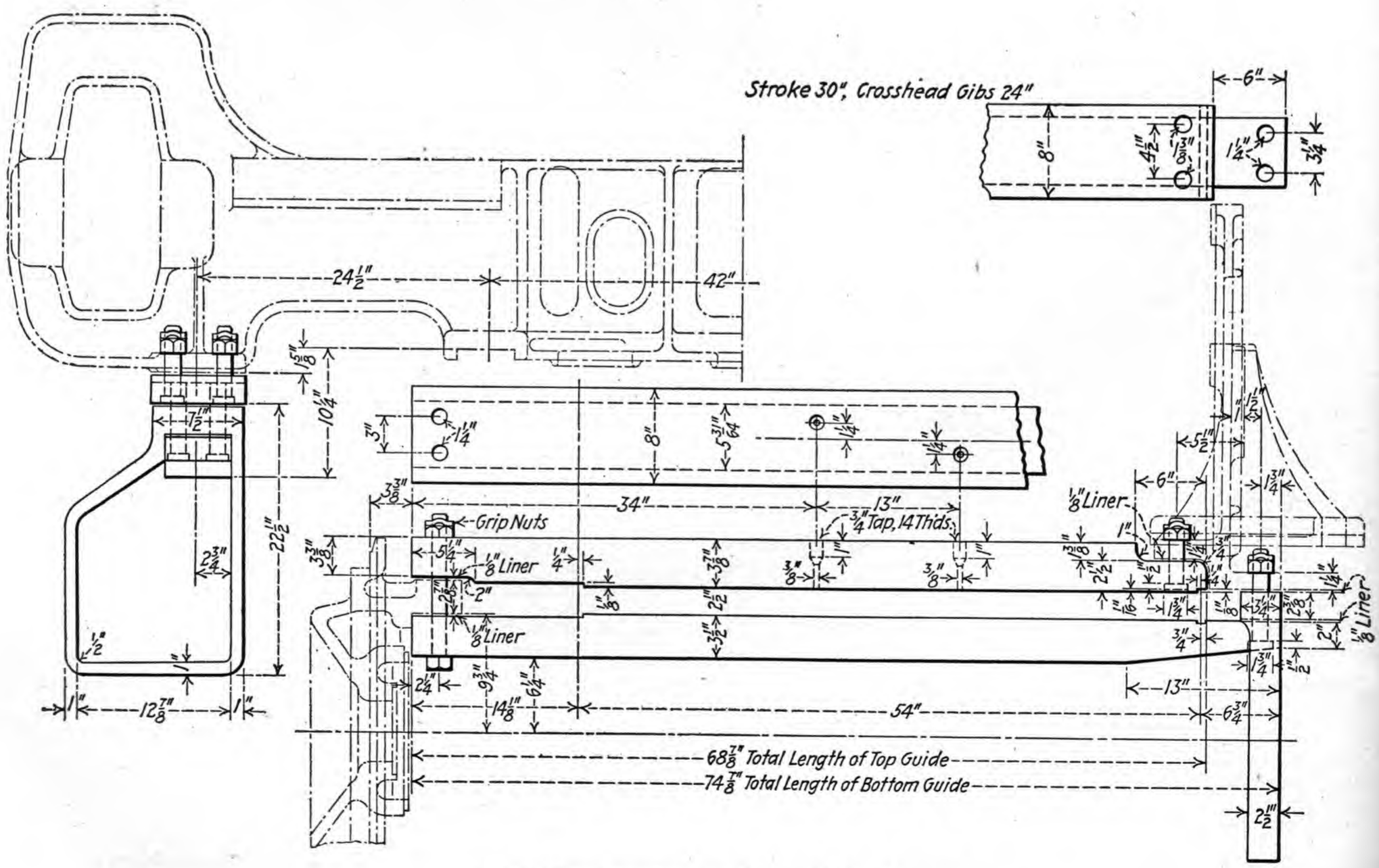
Alligator Type Crosshead for Chicago, Burlington & Quincy 4-8-4 Type, Class O-5a Locomotive with Timken Roller-Bearing Wrist Pin for Main Rod. The Timken Roller Bearing Company.



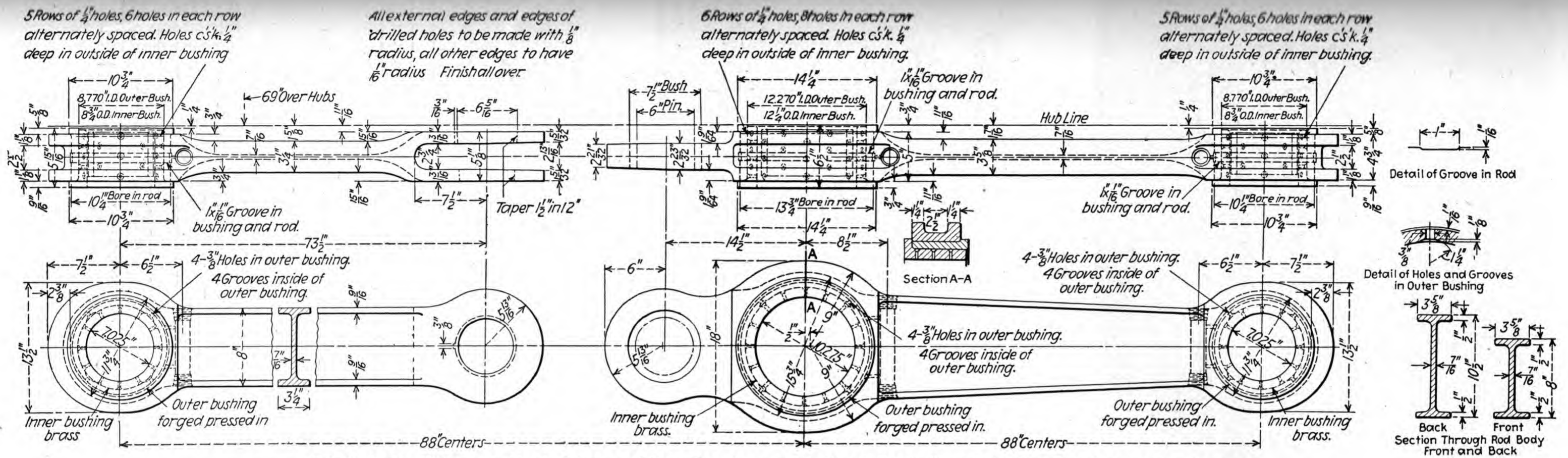
Multiple-Bearing Crosshead for St. Louis-San Francisco 4-8-4 Type Locomotives with cast steel body and separate aluminum shoe. Pin applied from inside.


Cast Iron
Taper 1/4 in 5"
Tension Neck of Crosshead 5,000 lb. □"
Shear on Key 10,000 lb. □"
Key on Crosshead Bearing Pressure 17,000 lb. □"
Tension in Rod f = 13 100 lb. □"
Bearing Pres. Key on Pod 20,300 lb. □"
Gibb Area 26 1/2 □"
Grip Nut
Grip Nut
Pin Nickle Steel
Taper 1/4 in 5"
Bearing Pres. 5,200 lb. □"

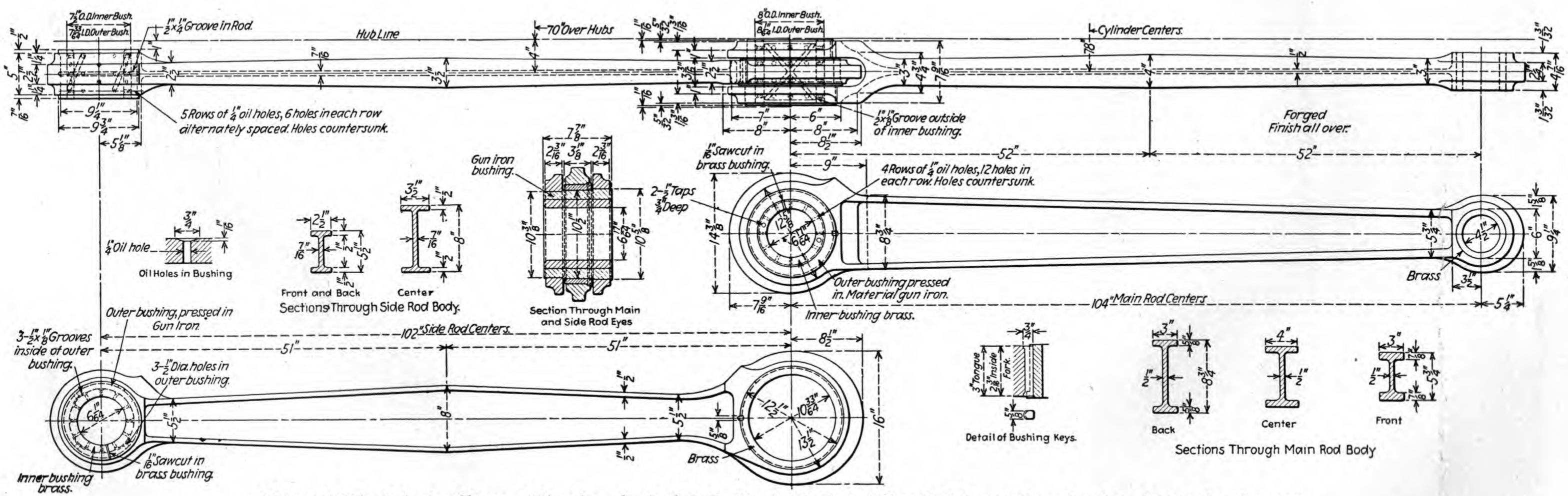
Laird Type Crosshead.



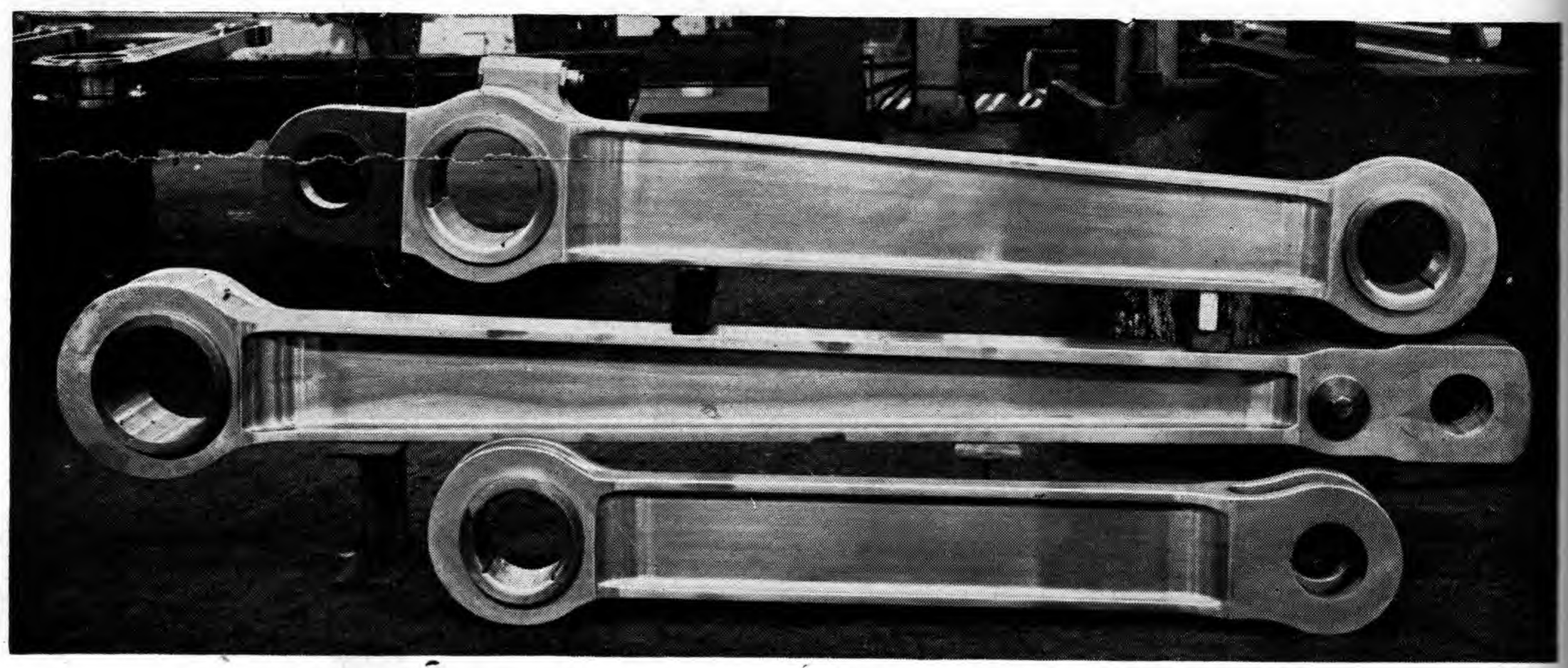
Laird Type Crosshead Guides and Attachments.


5 Rows of 1/4" holes, 6 holes in each row alternately spaced. Holes c'sk. 1/2" deep in outside of inner bushing
All external edges and edges of drilled holes to be made with 1/8" radius, all other edges to have 1/16" radius Finish all over
6 Rows of 1/4" holes, 8 holes in each row alternately spaced. Holes c'sk. 1/4" deep in outside of inner bushing.
5 Rows of 1/4" holes, 6 holes in each row alternately spaced. Holes c'sk. 1/4" deep in outside of inner bushing.
8.770" I.D. Outer Bush.
8 3/4" O.D. Inner Bush.
69" Over Hubs
7 1/2" Bush
6" Pin
14 1/4"
12.270" I.D. Outer Bush.
12 1/4" O.D. Inner Bush.
1 x 1/16" Groove in bushing and rod.
Hub Line
10 3/4"
10 1/4" Bore in rod
13 3/4" Bore in rod
14 1/4"
14 1/2"
8 1/2"
73 1/2"
Taper 1/2" in 12"
7 1/2"
6 1/2"
4-3/8" Holes in outer bushing. 4 Grooves inside of outer bushing.
Section A-A
Detail of Groove in Rod
Detail of Holes and Grooves in Outer Bushing
Back
Front
Section Through Rod Body Front and Back
Inner bushing brass
Outer bushing forged pressed in
88" Centers

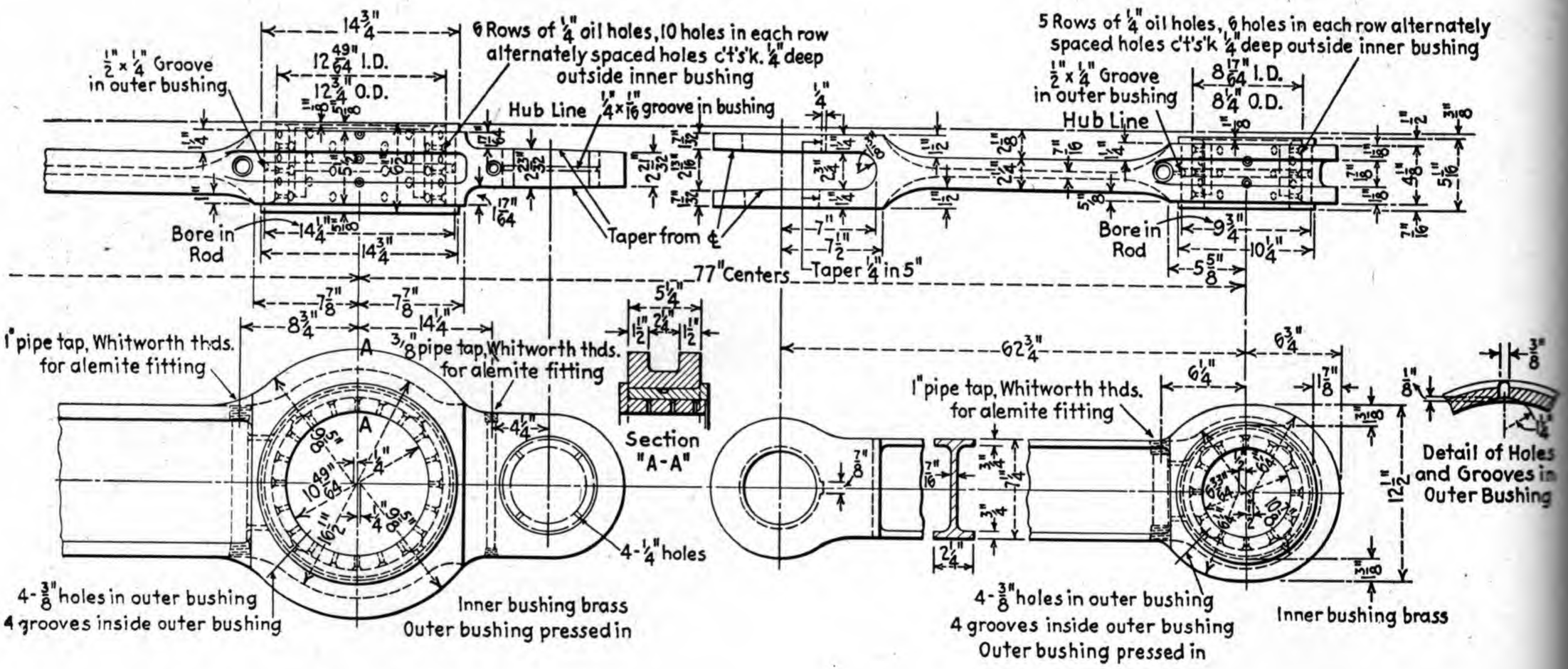
Side Rods for Chicago & North Western 4-6-4 Type Locomotive, Streamlined, Class E-4. American Locomotive Company.


7 1/2" O.D. Inner Bush.
6 3/4" I.D. Outer Bush.
1" x 1" x 1/4" Groove in Rod.
Hub Line
70" Over Hubs
8" O.D. Inner Bush.
8 1/8" I.D. Outer Bush.
Cylinder Centers.
5 Rows of 1" oil holes, 6 holes in each row alternately spaced. Holes countersunk.
1" x 1/2" Groove outside of inner bushing.
Forged Finish all over.
52"
Gun iron bushing.
1/16" Sawcut in brass bushing.
4 Rows of 1" oil holes, 12 holes in each row. Holes countersunk.
2-1" Taps 3/4" Deep
Oil Holes in Bushing
Front and Back
Center
Sections Through Side Rod Body.
Section Through Main and Side Rod Eyes
Outer bushing pressed in. Material gun iron.
Inner bushing brass.
104" Main Rod Centers
Brass
Outer bushing, pressed in Gun Iron.
102" Side Rod Centers.
51"
3-1" x 1/2" Grooves inside of outer bushing.
3-1" Dia. holes in outer bushing.
1/16" Sawcut in brass bushing.
Inner bushing brass.
Detail of Bushing Keys.
Back
Center
Front
Sections Through Main Rod Body

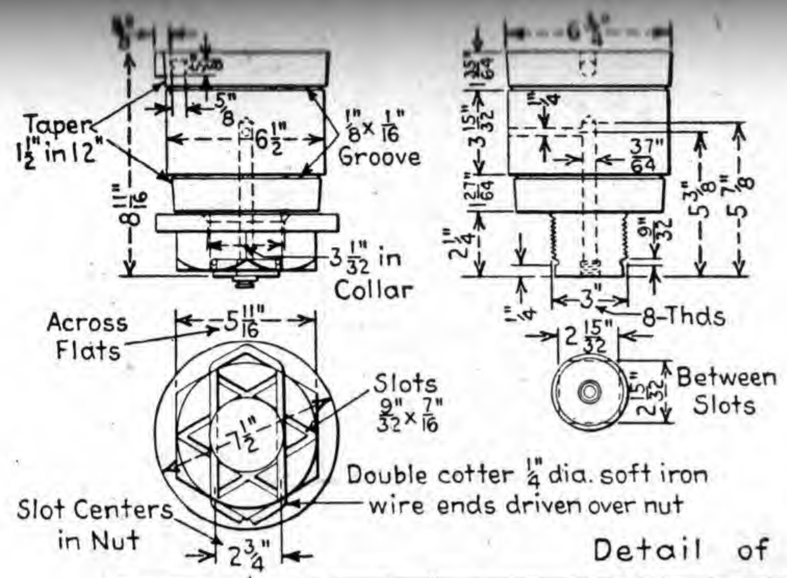
Main and Side Rods for Chicago, Milwaukee, St. Paul & Pacific 4-4-2 Type "Hiawatha" Locomotive, American Locomotive Company.

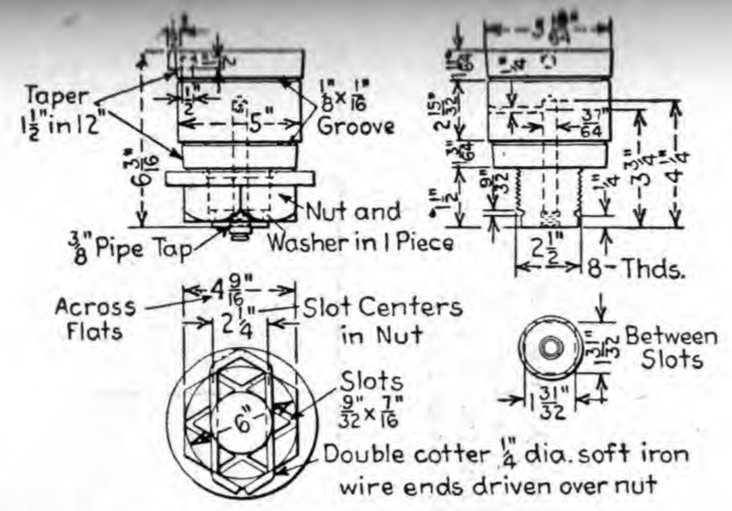


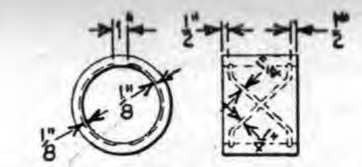
Main and Side Rods of Chesapeake & Ohio 4-6-4 Type Locomotives, Class L-2. The Baldwin Locomotive Works.

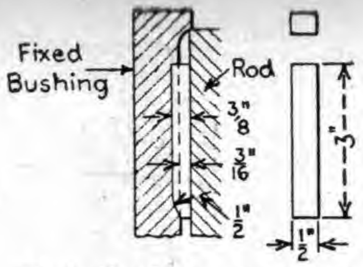

14 3/4"
6 Rows of 1/4" oil holes, 10 holes in each row alternately spaced holes c't's'k. 1/4" deep outside inner bushing
1/2" x 1/4" Groove in outer bushing
12 49/64" I.D.
12 3/4" O.D.
Hub Line
1/4" x 1/16" groove in bushing
5 Rows of 1/4" oil holes, 6 holes in each row alternately spaced holes c't's'k 1/4" deep outside inner bushing
8 17/64" I.D.
8 1/4" O.D.
Bore in Rod
Taper from ℄
77" Centers
Taper 1/4" in 5"
1" pipe tap, Whitworth thds. for alemite fitting
3/8" pipe tap, Whitworth thds. for alemite fitting
Section "A-A"
4-1/4" holes
4-3/8" holes in outer bushing
4 grooves inside outer bushing
Inner bushing brass
Outer bushing pressed in
Detail of Holes and Grooves in Outer Bushing

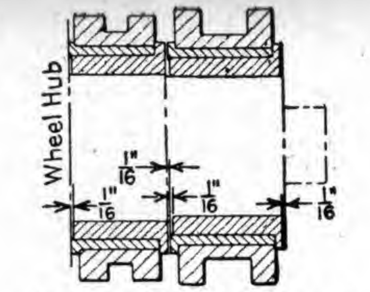
Side Rods for Chicago, Burlington & Quincy 4-8-4 Type, Class O-5a Locomotive. The Baldwin Locomotive Works.



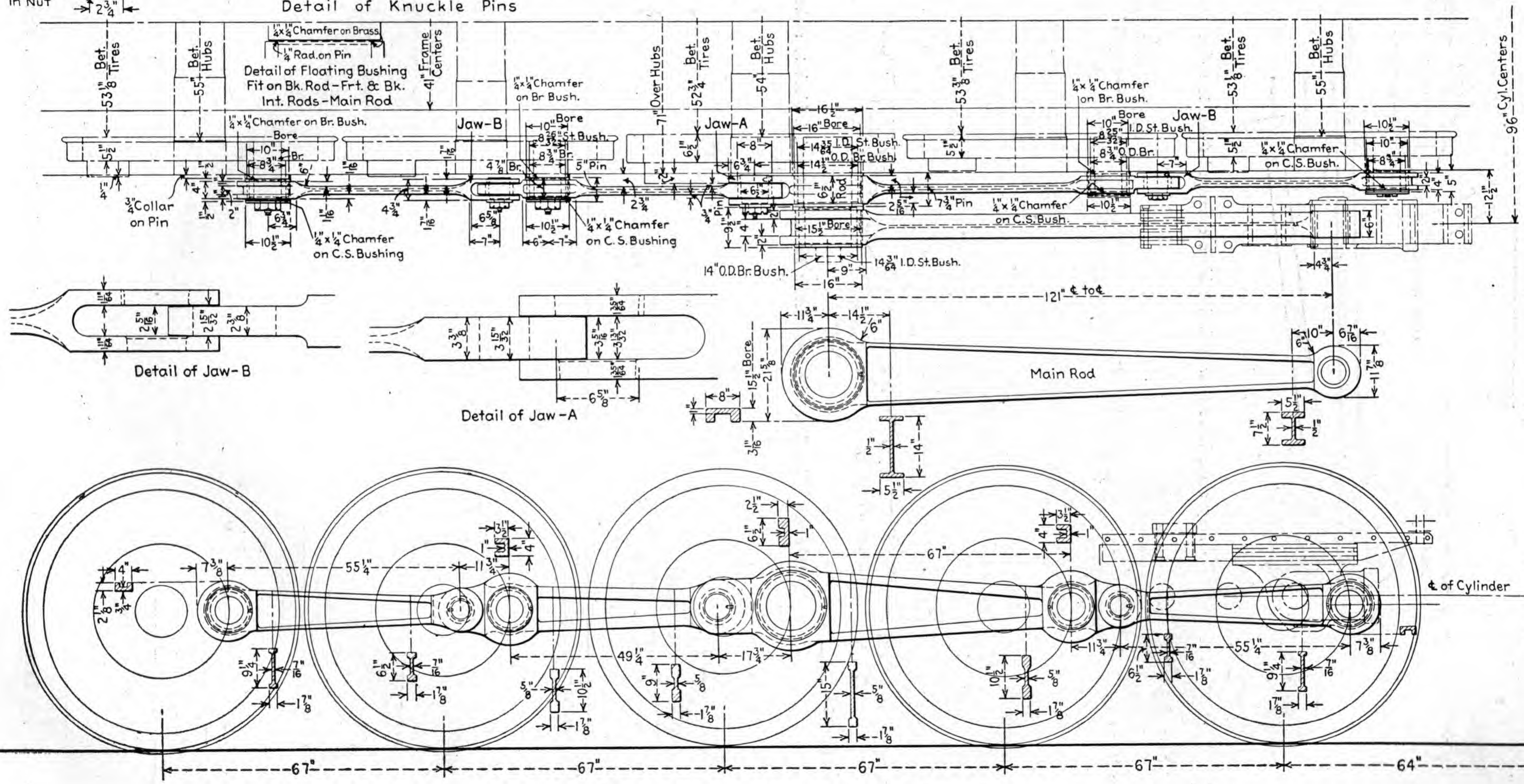




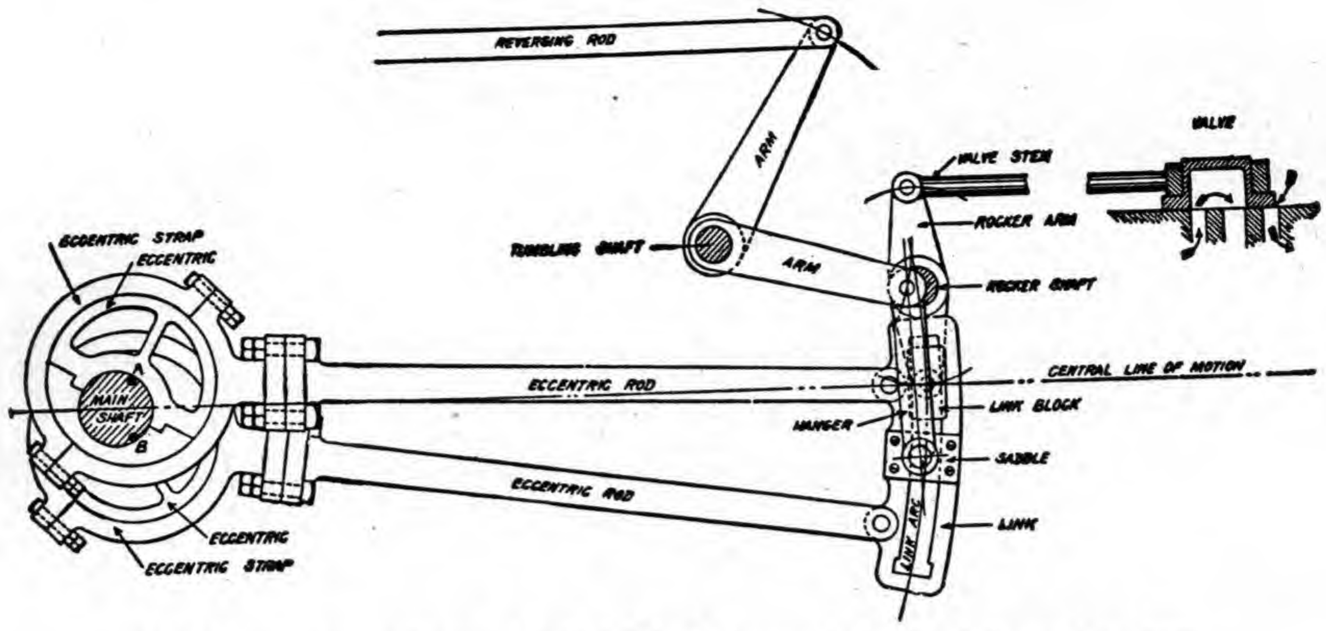




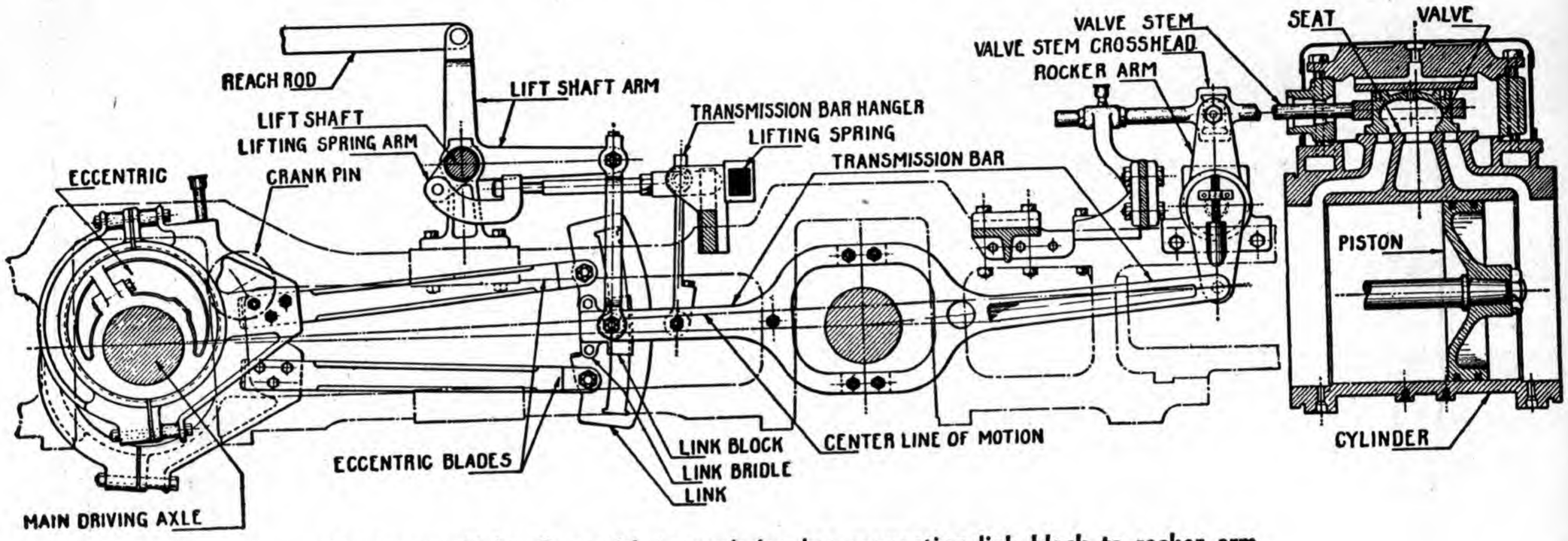
Detail of Knuckle Pins



Main and side rods for Bessemer & Lake Erie 2-10-4 Type Locomotives.



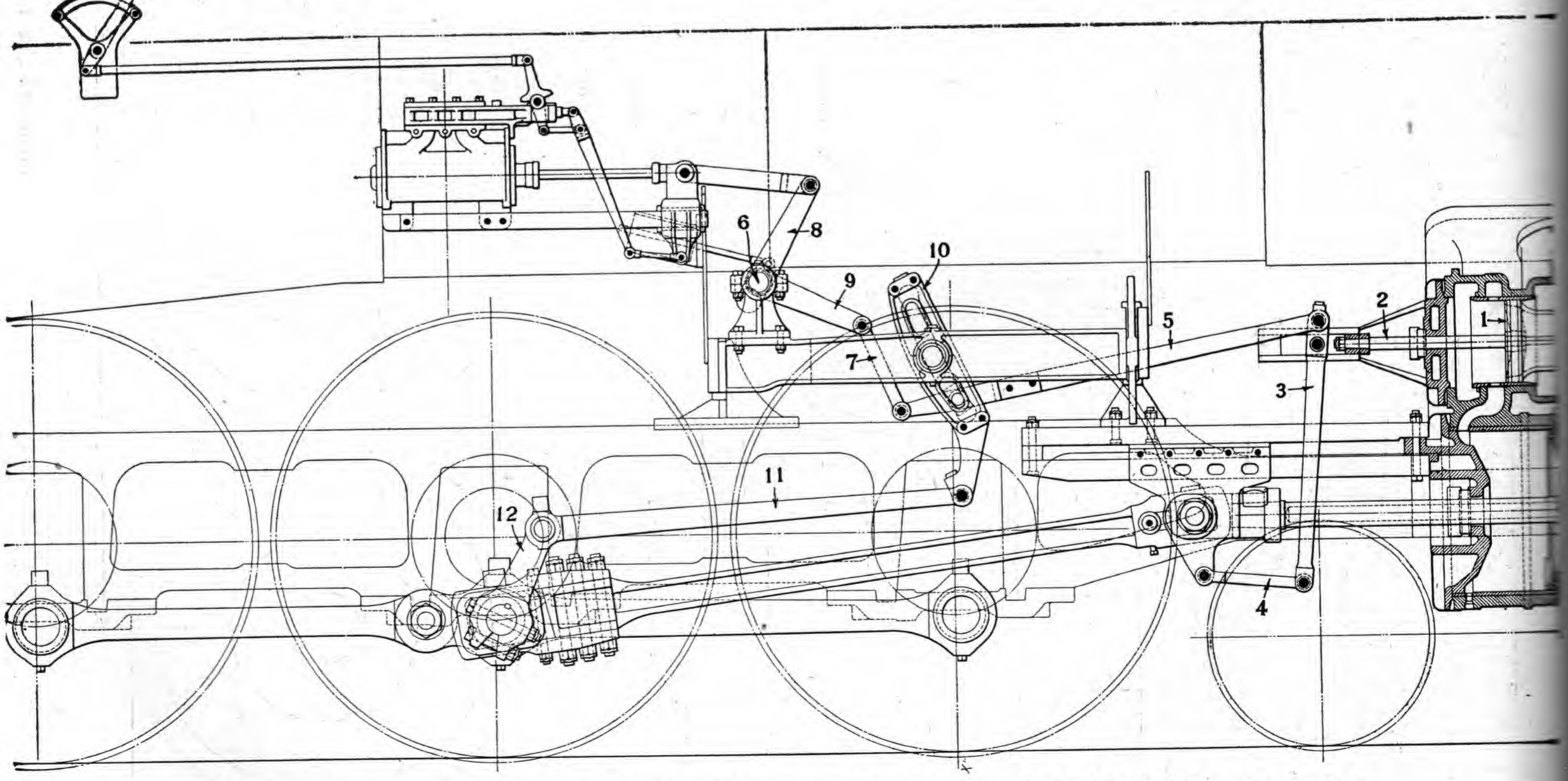
Stephenson Valve Gear with link block connected direct to rocker arm.



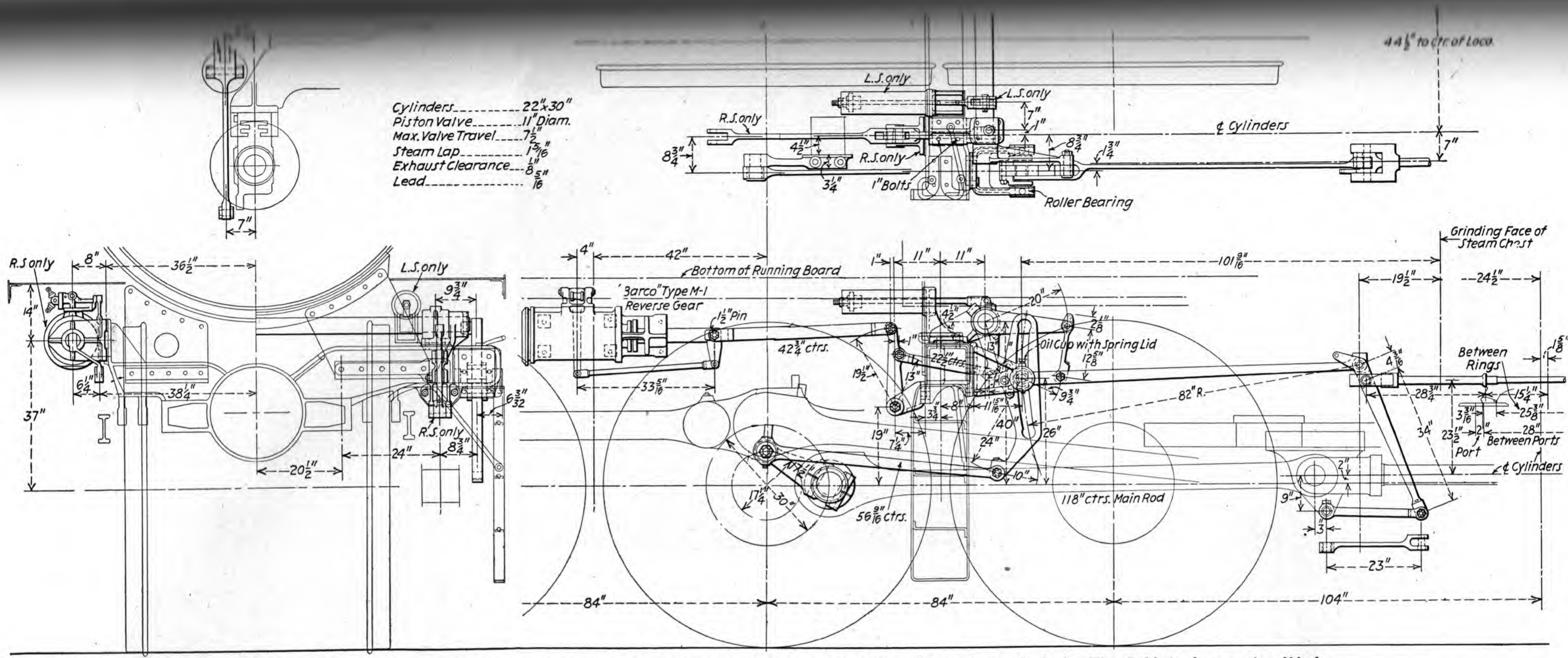
Stephenson Valve Gear with transmission bar connecting link block to rocker arm.

Names of Parts of Walschaert Gear

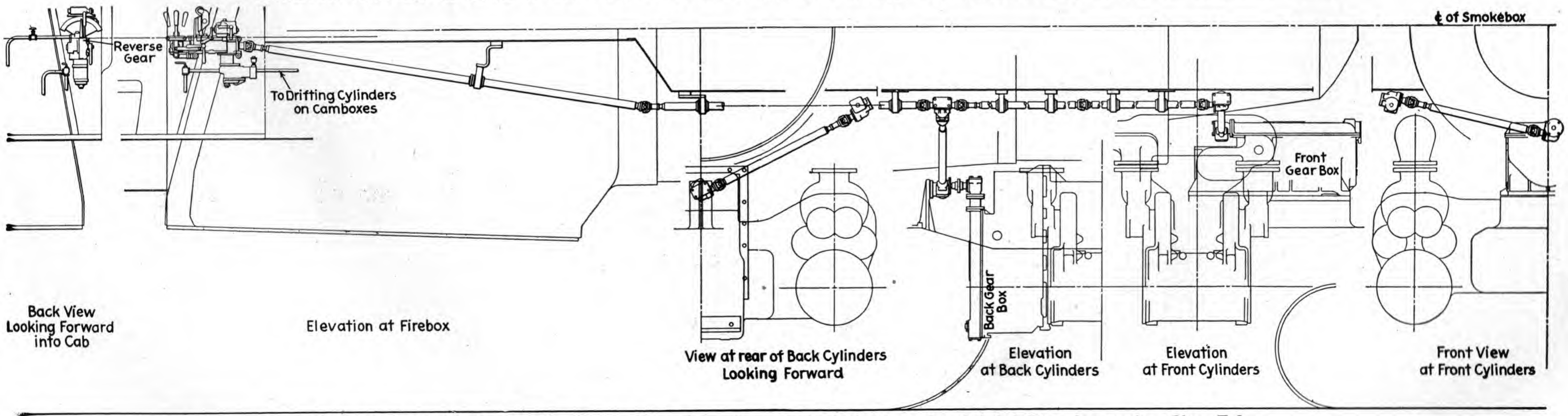
1 *Valve*
2 *Valve Stem*
3 *Combination Lever*
4 *Crosshead Link*
5 *Radius Rod*
6 *Reverse Shaft*
7 *Lifting Link*
8 *Reverse Shaft Lever*
9 *Reverse Shaft Arm*
10 *Reverse Link*
11 *Eccentric Rod*
12 *Eccentric Crank*



Elevation showing general arrangement of a Walschaerts Valve Gear for a 4-6-2 (Pacific) Type Locomotive.

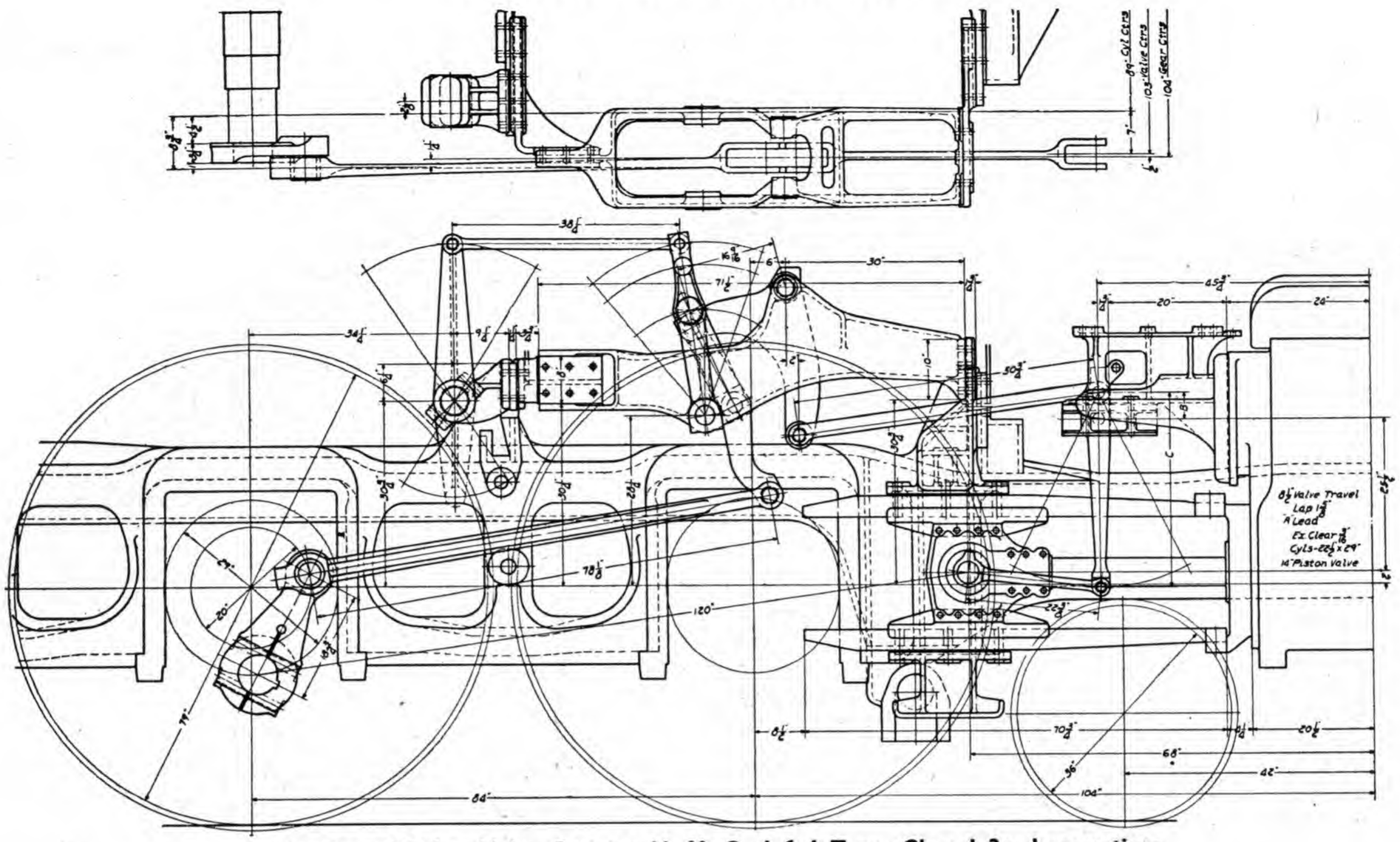


Walschaerts Valve Gear as applied to New York, New Haven & Hartford 4-6-4 Type Locomotives. Built by The Baldwin Locomotive Works.

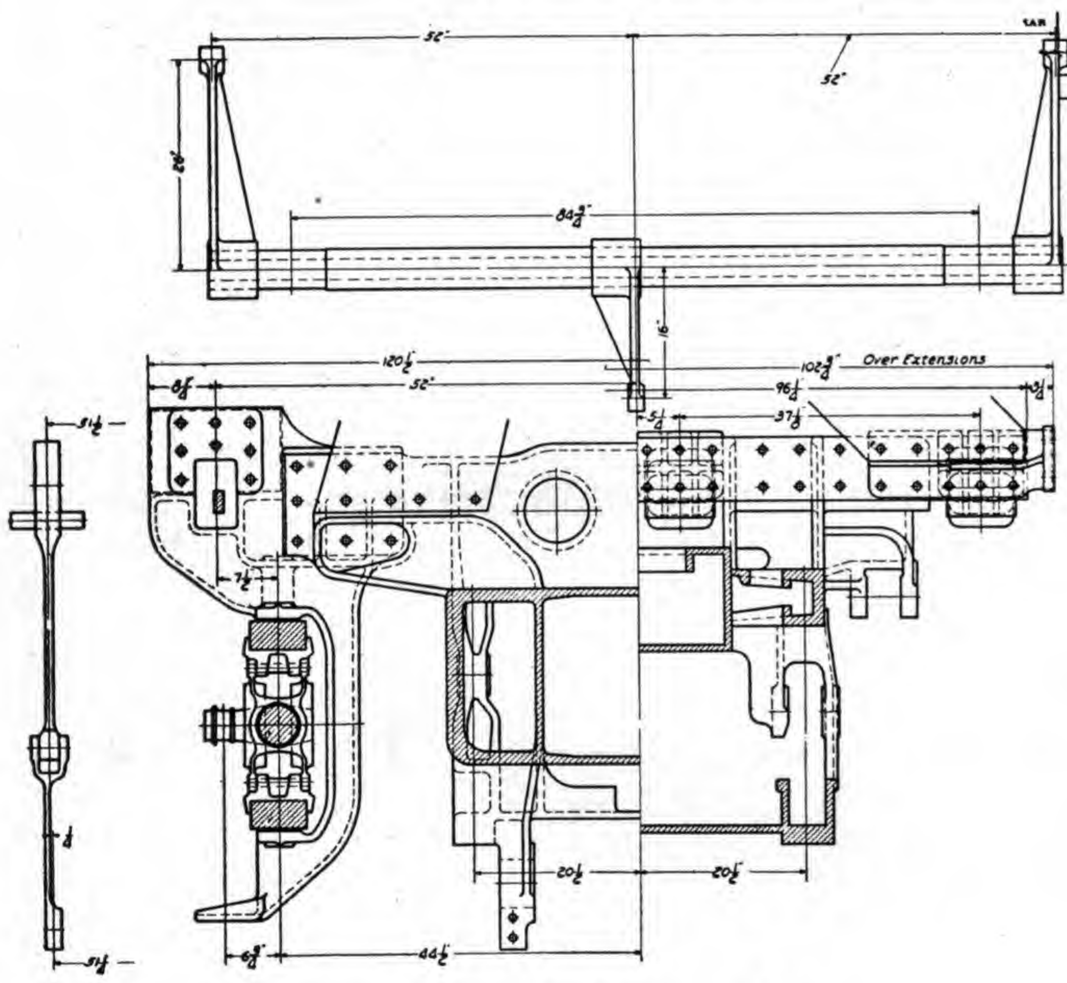

Reverse Gear
To Drifting Cylinders on Camboxes
¢ of Smokebox
Front Gear Box
Back Gear Box
Back View Looking Forward into Cab
Elevation at Firebox
View at rear of Back Cylinders Looking Forward
Elevation at Back Cylinders
Elevation at Front Cylinders
Front View at Front Cylinders

Control Mechanism for Franklin Poppet Valve Gear. Pennsylvania Railroad Duplex 4-4-4-4 Type Locomotive, Class T-1.

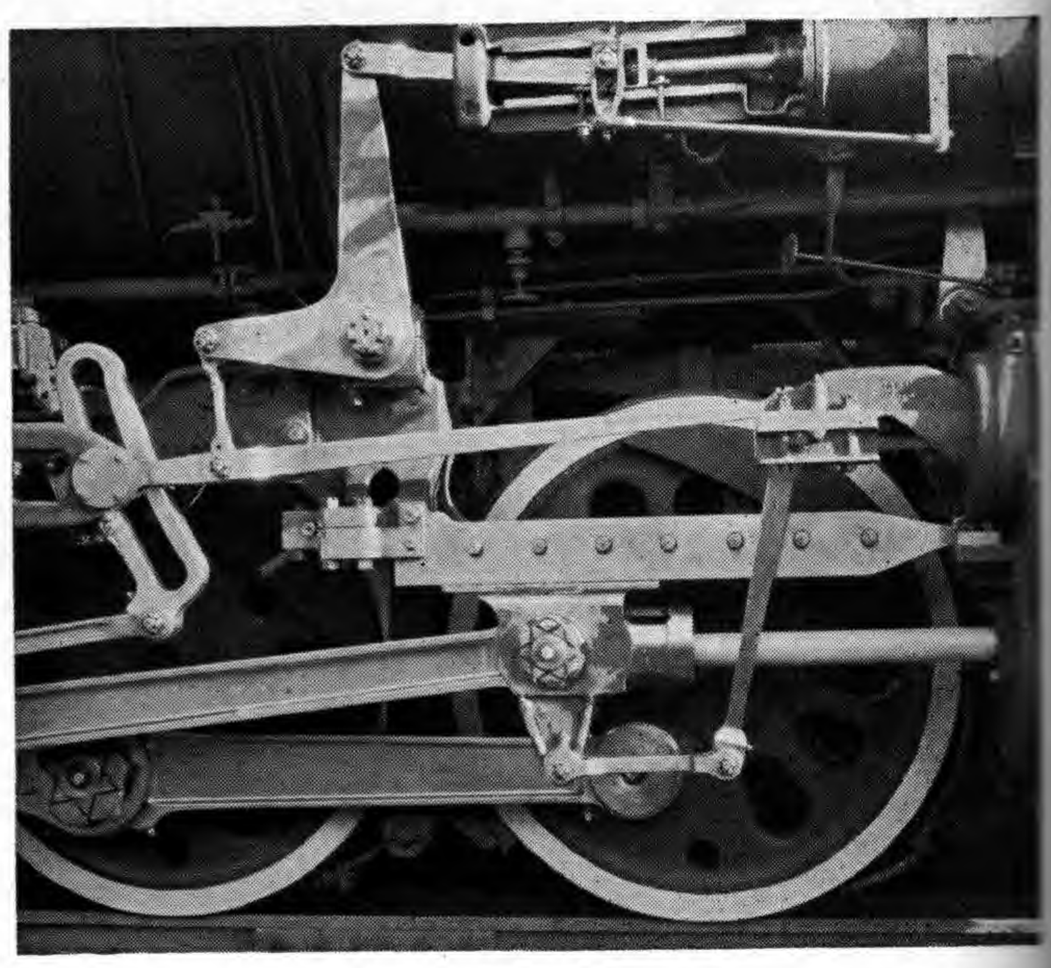
ENGINE: Baker Valve Gear



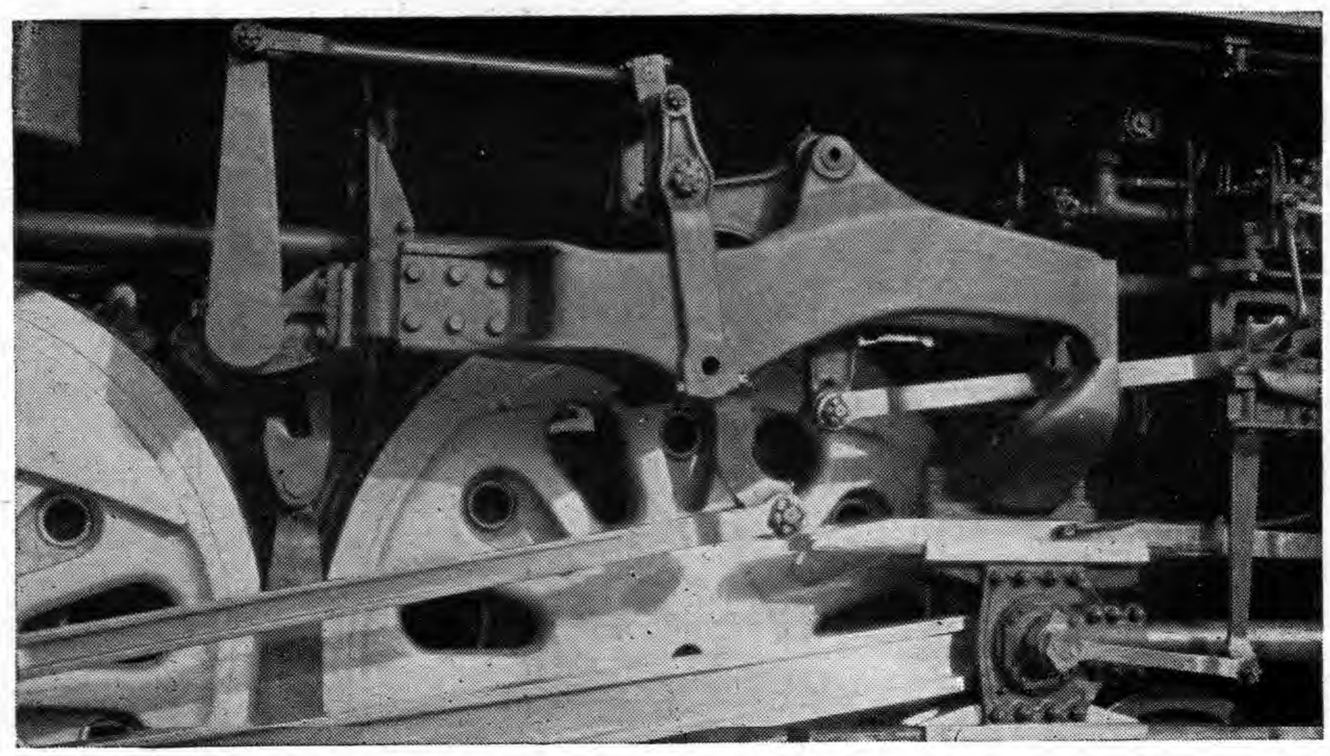
Application of Baker Valve Gear on N. Y. C. 4-6-4 Type, Class J-3a, Locomotives.



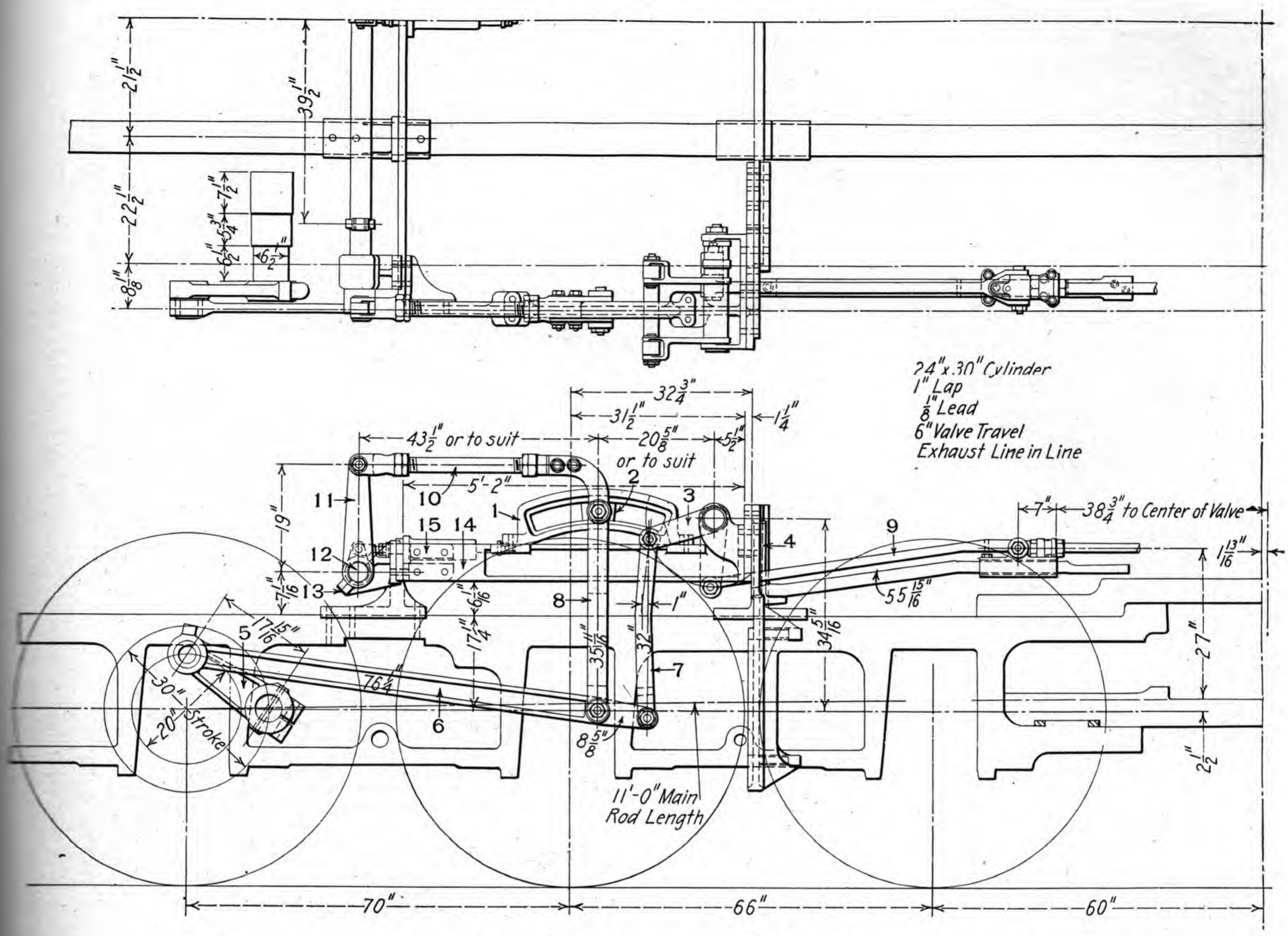
Cross Sections of J-3a Locomotive



Valve Gear and Reverse Gear, Rear Engine Unit, Union Pacific 4-8-8-4 Type Locomotive.



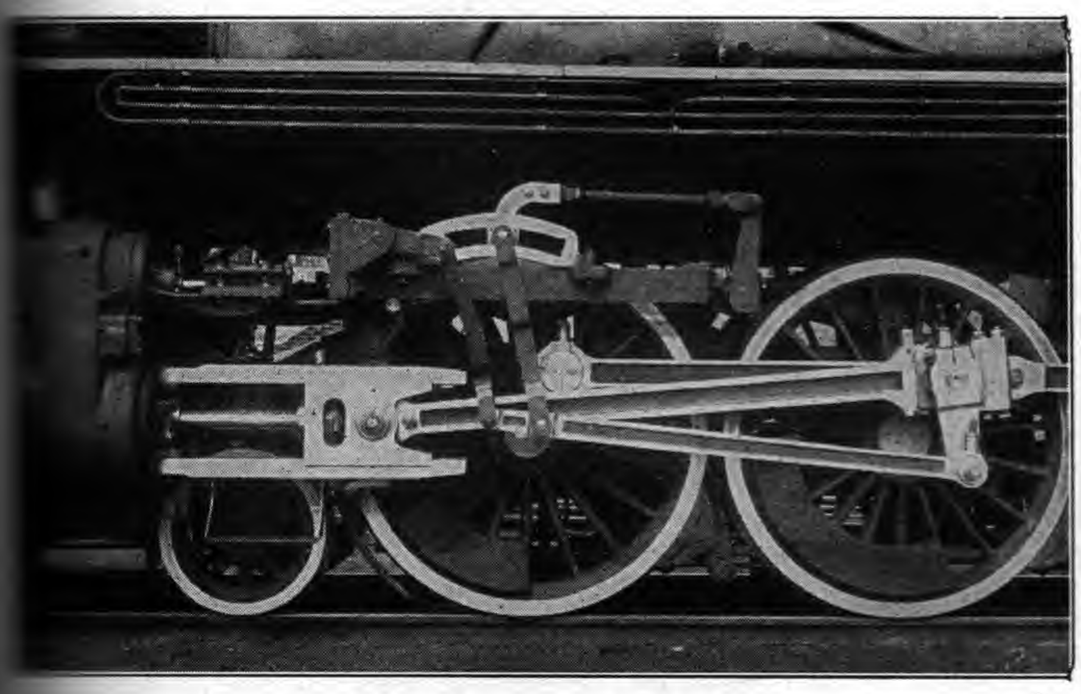
Baker Valve Gear on New York Central Hudson Type Locomotives.



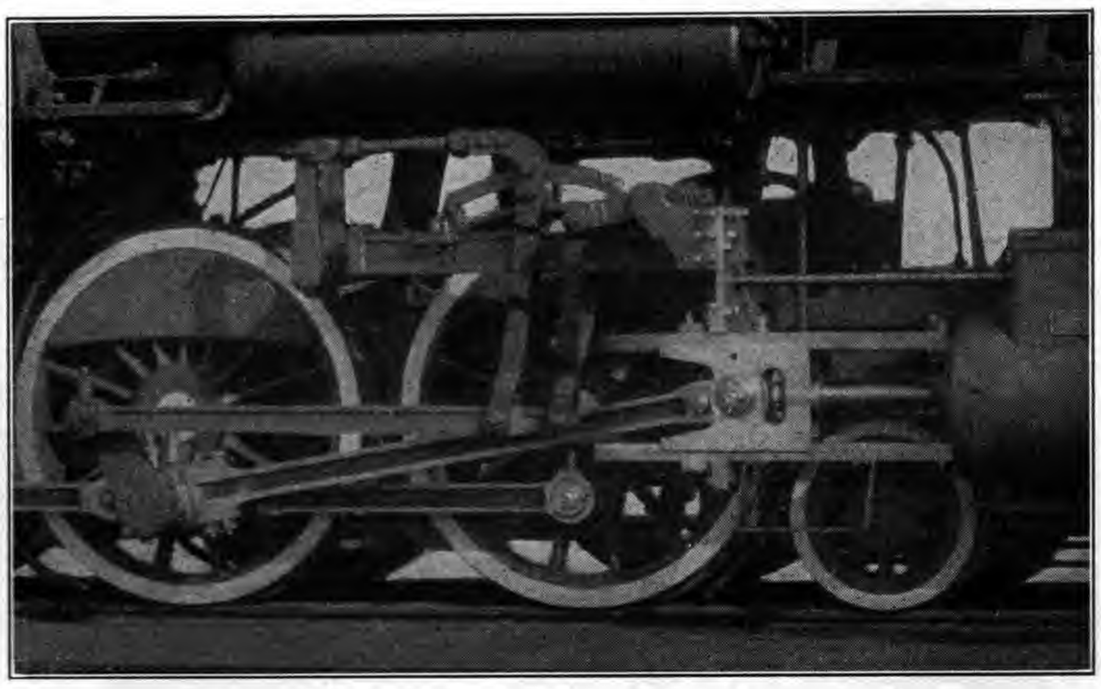
General arrangement of the Southern Valve Gear for a 2-8-0 (Consolidation) Type Locomotive.

Names of Parts of Southern Valve Gear

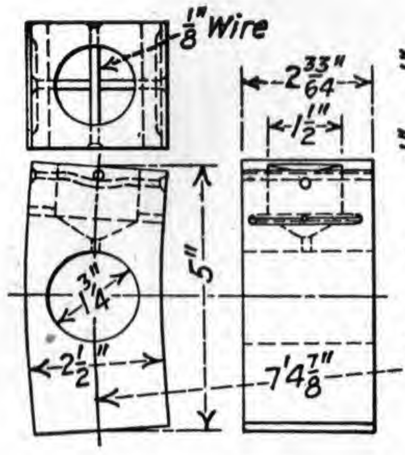
1 *Link*
2 *Link Block*
3 *Bell Crank*
4 *Guide Yoke*
5 *Eccentric Crank*
6 *Eccentric Rod*
7 *Transmission Yoke*
8 *Radius Hanger*
9 *Valve Rod*
10 *Auxiliary Reach Rod*
11 *Reverse Shaft Arm*
12 *Reverse Shaft*
13 *Reverse Shaft Bearing*
14 *Link Support*
15 *Link Support Corner Bracket*



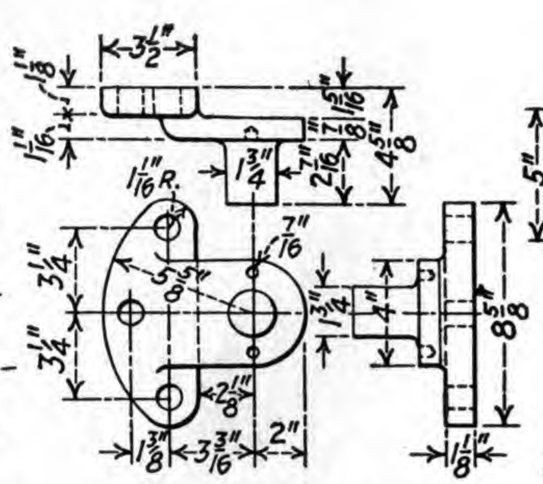
Southern Valve Gear for Inside Admission



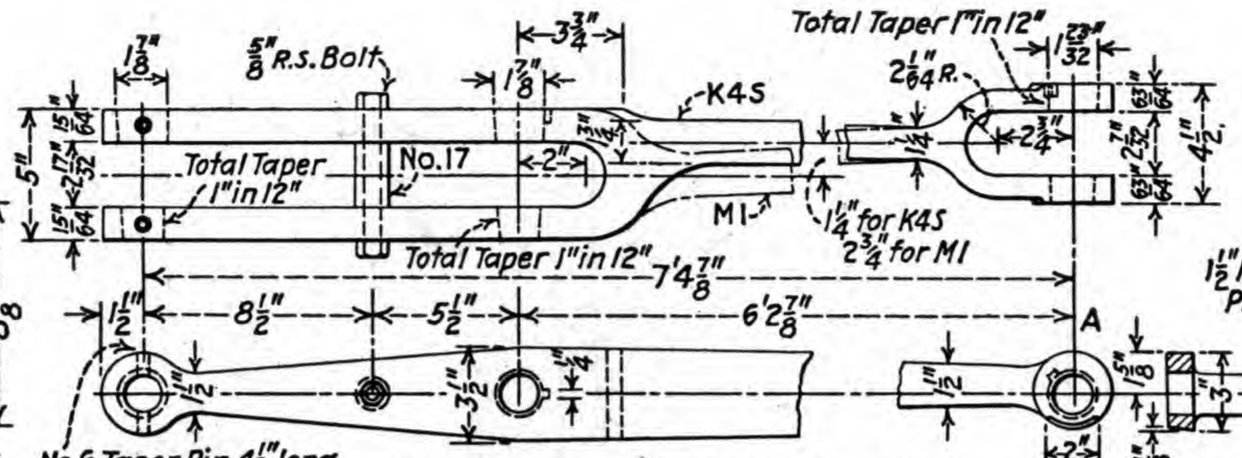
Southern Valve Gear for Outside Admission.



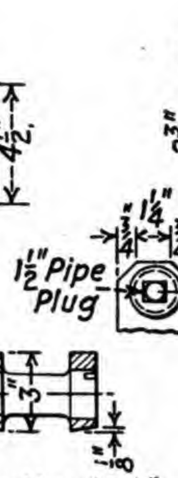
No.19-O.H.S. Two Thus
All "D" and C.H.



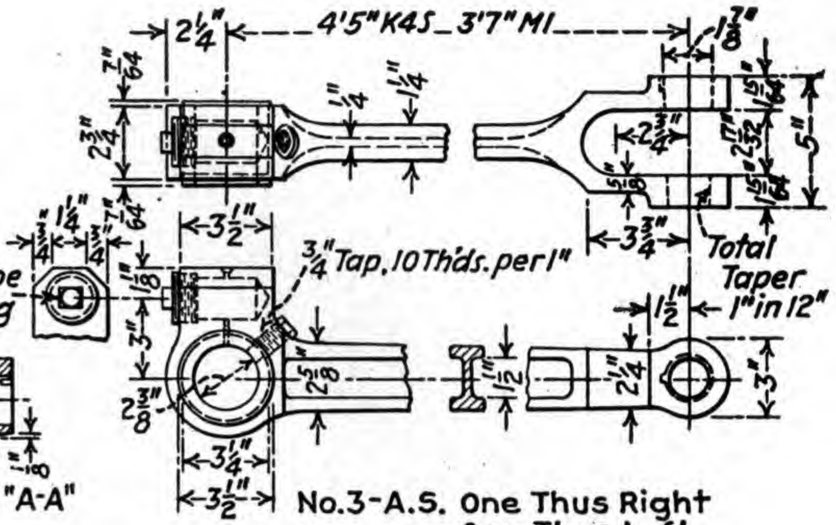
No.18-F-363 O.H.S.
Four Thus All "D"



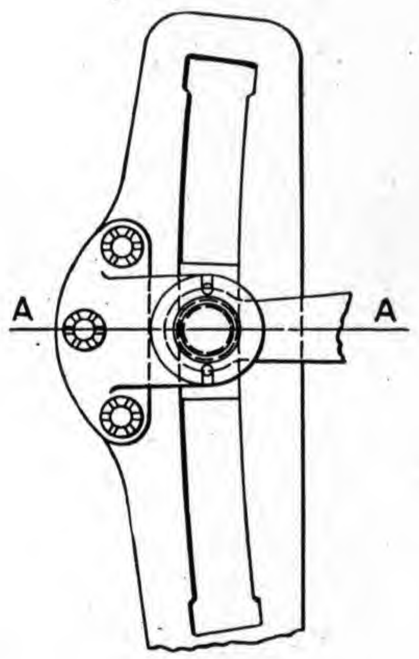
No.1 A.S. One Thus Right, One Thus Left
Right Detail Shown

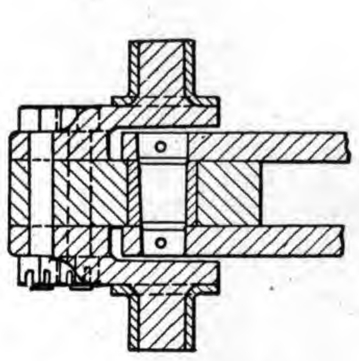


Section "A-A"

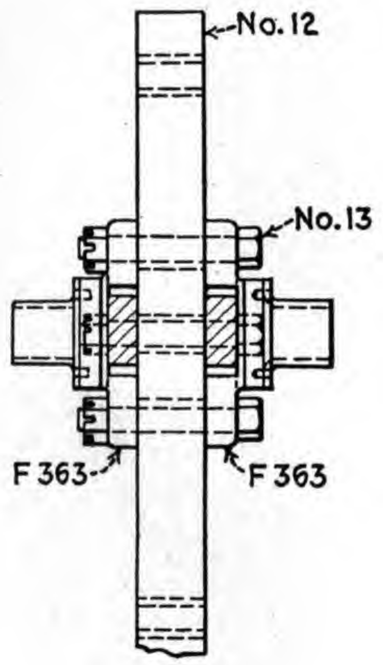


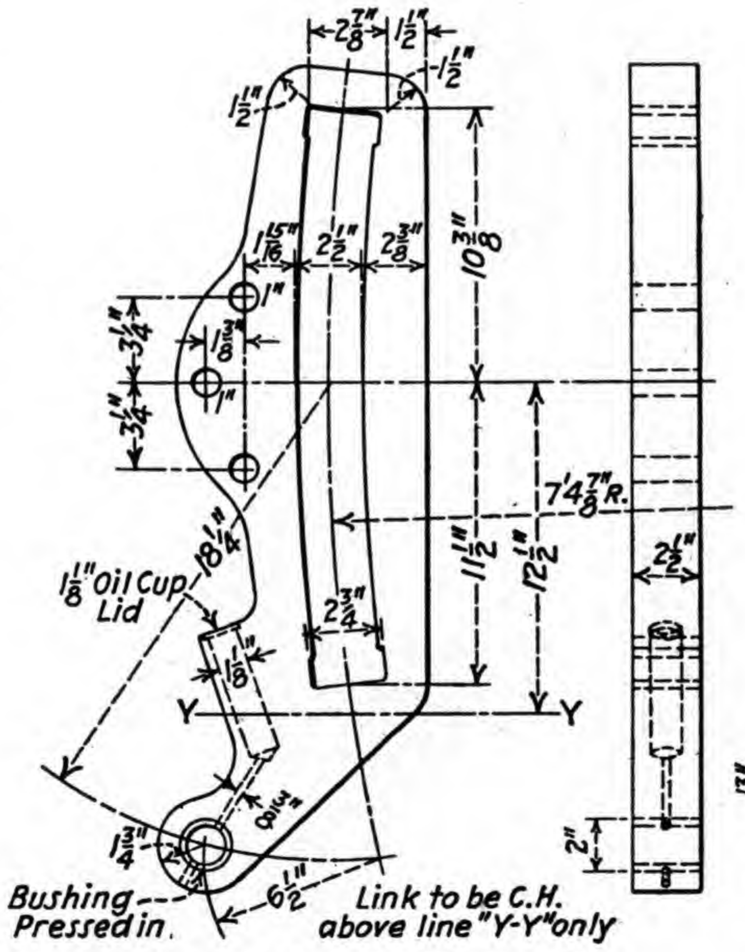
No.3-A.S. One Thus Right
One Thus Left
Right Detail Shown



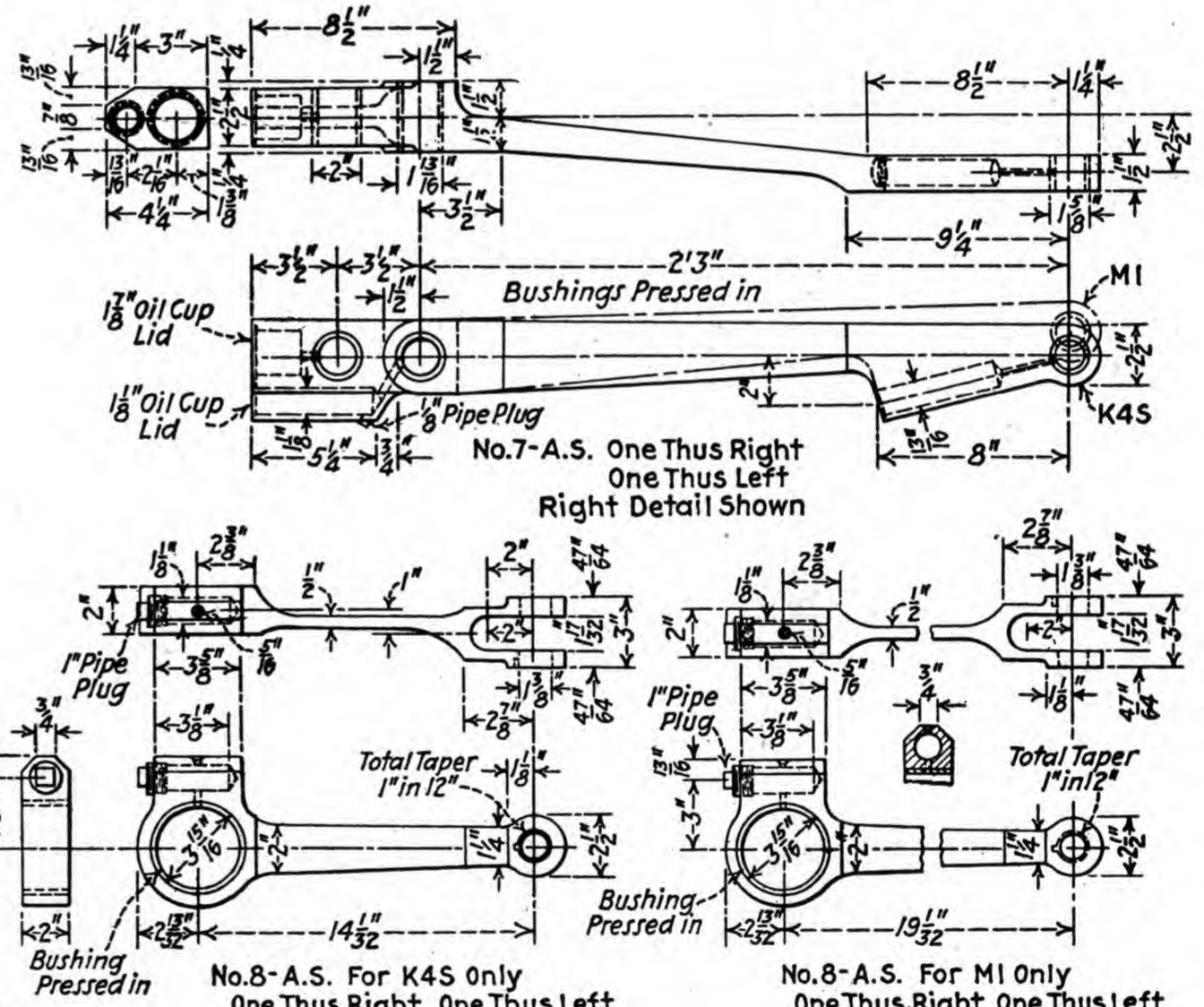


Section "A-A"





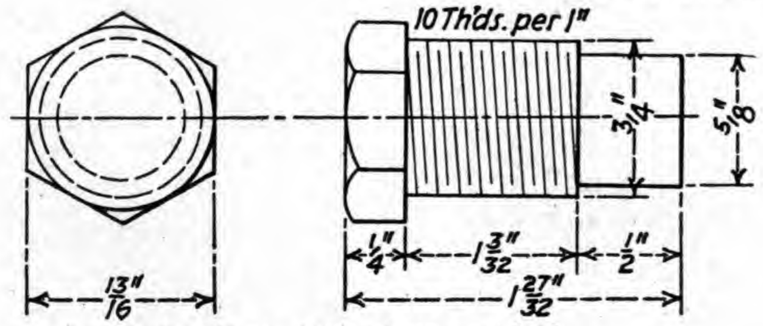
No.12-O.H.S. All "D" Two Thus



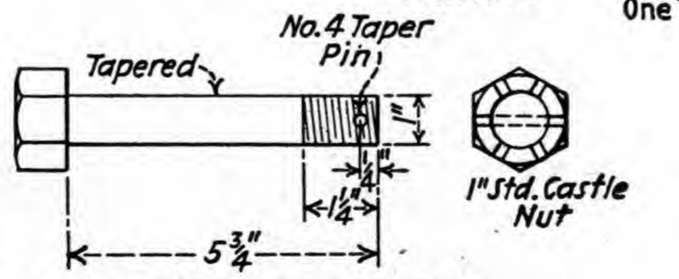
No.7-A.S. One Thus Right
One Thus Left
Right Detail Shown

No.8-A.S. For K4S Only
One Thus Right, One Thus Left
Right Detail Shown

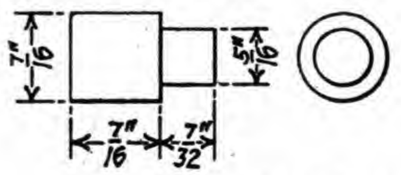
No.8-A.S. For M1 Only
One Thus Right, One Thus Left
Right Detail Shown



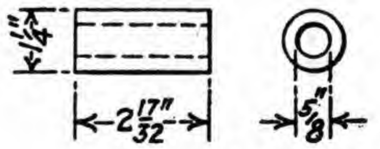
No.6-Steel Two Thus All "D"



No.13-O.H.S. Six Thus All "D"



No.5-Steel Twelve Thus
All "D"



No.17-O.H.S. Two Thus
All "D"

Details of Walschaerts Valve Gear for 4-6-2 Type Locomotives, Class K-4s, and 4-8-2 Type Locomotives, Class M-1. The Pennsylvania Railroad.
(Note—A number of changes in details have been made for later applications)

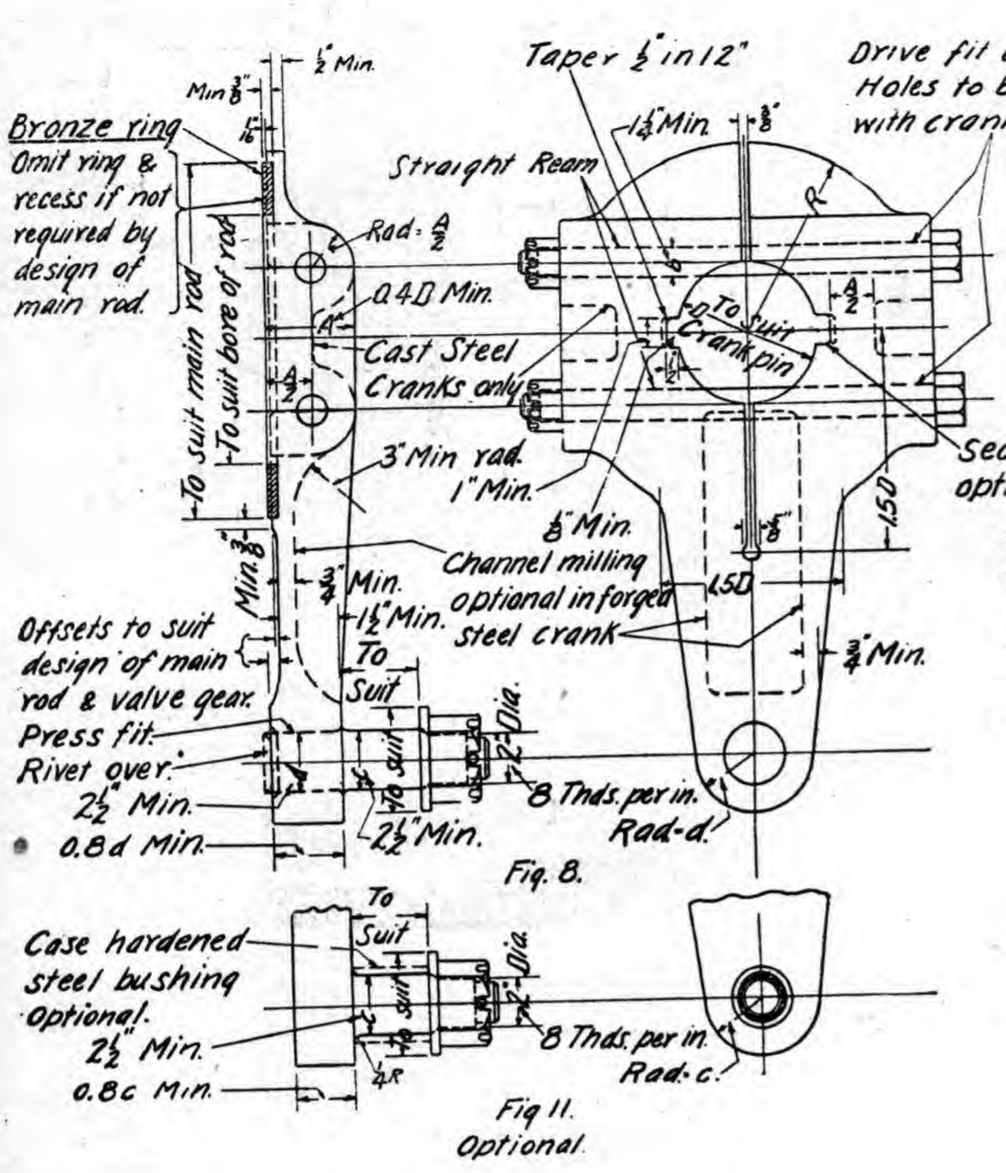


Fig. 8.

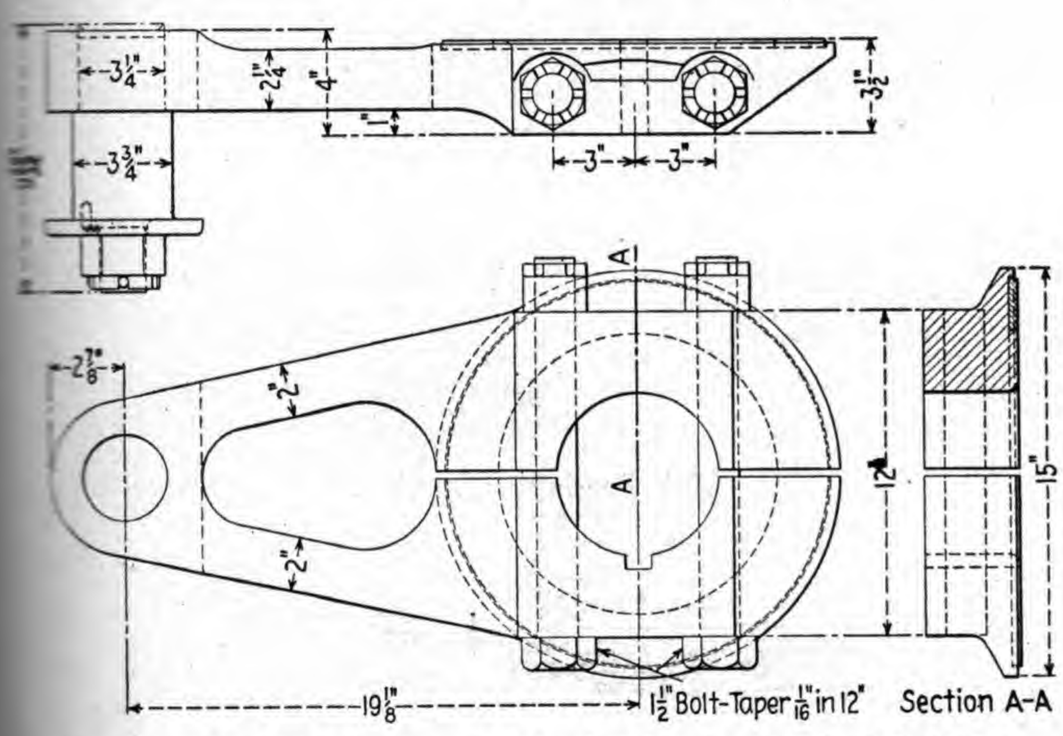
Fig. 9

Fig 10

Fig 11.
Optional.

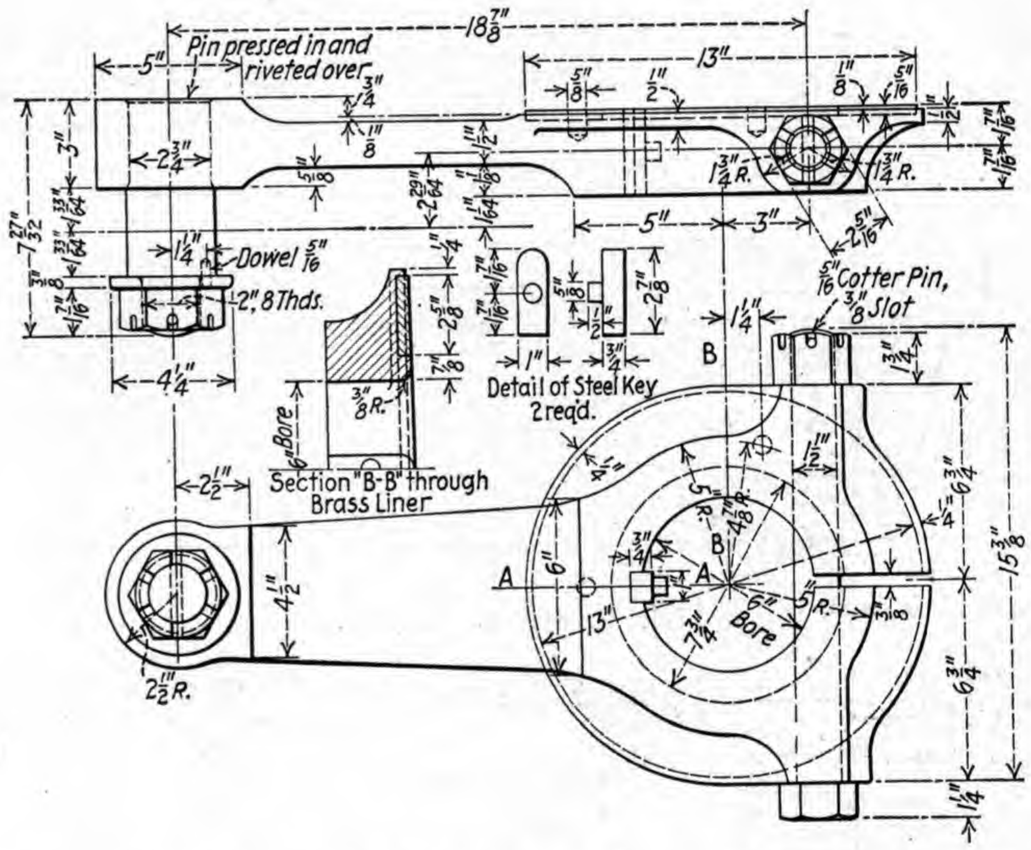
A.A.R. Recommended Designs of Eccentric Crank Arms.

(*Mechanical Div. Proceedings*, 1931)

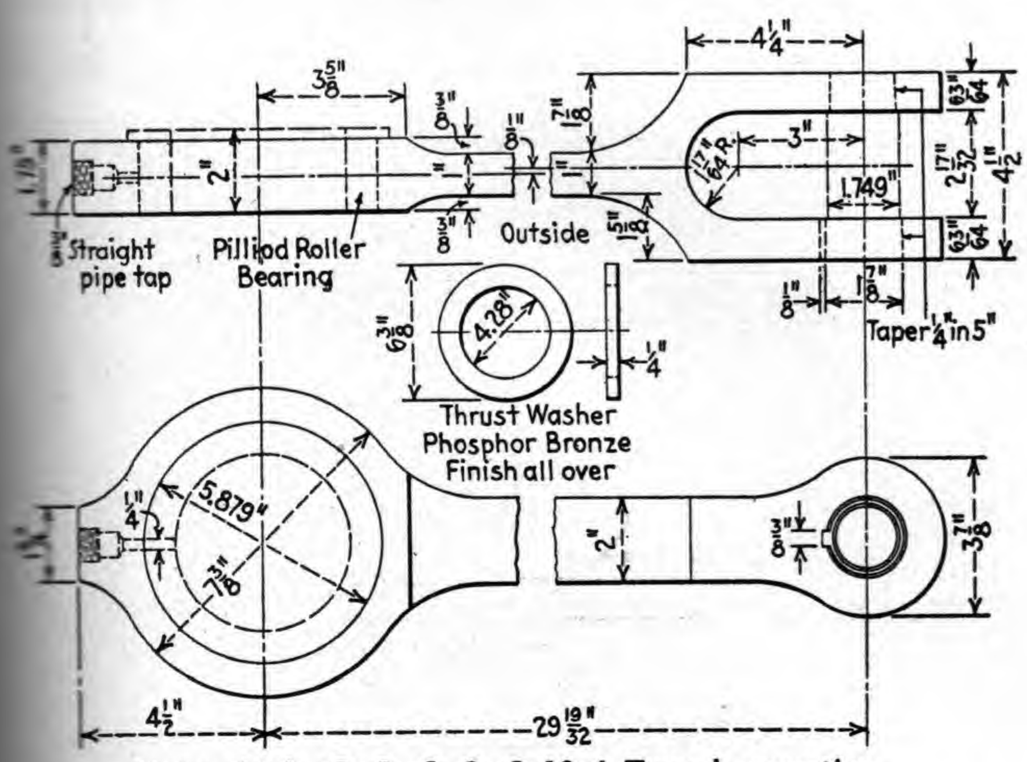


Eccentric Crank for Chicago & North Western rebuilt 4-8-4 Type Locomotive, Class H-1. Weight 190 lb.

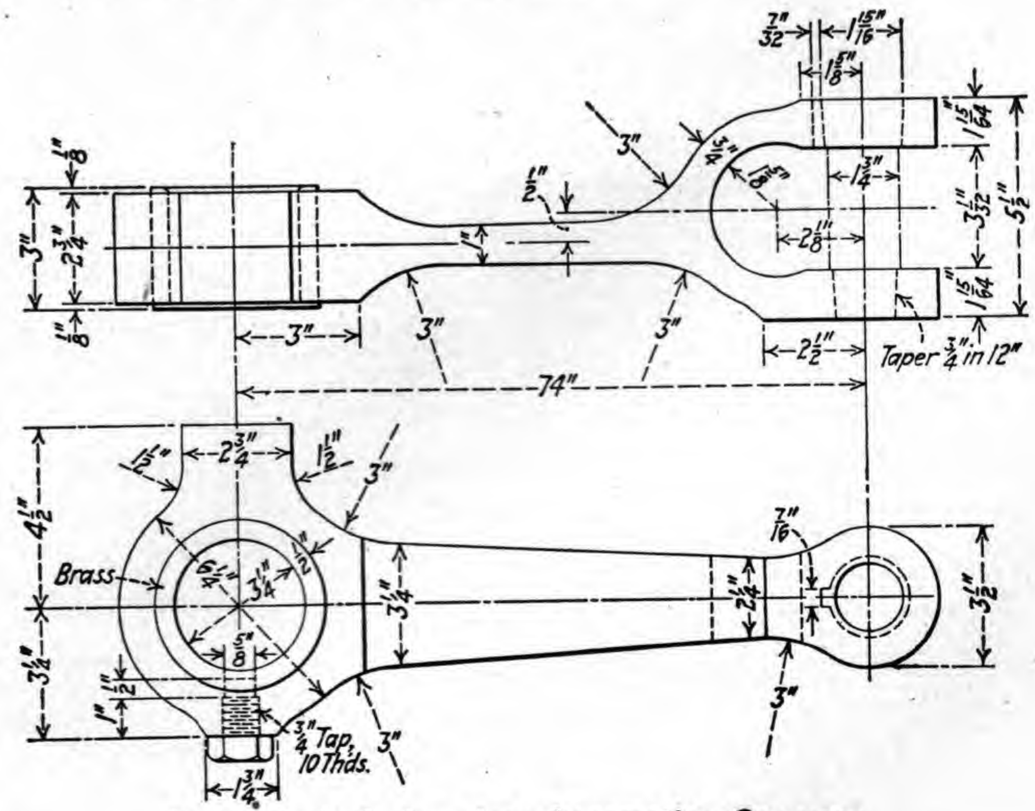
Description: *Railway Mechanical Engineer*, June 1946.


Pin pressed in and riveted over
2 3/4" Dowel 5/16"
2", 8 Thds.
5/16" Cotter Pin, 3/8" Slot
Detail of Steel Key 2 req'd.
Section "B-B" through Brass Liner
6" Bore
7 3/4" Bore

Eccentric Crank, Walschaerts Valve Gear, with Bronze Bearing Surface. Chicago, Milwaukee, St. Paul & Pacific.

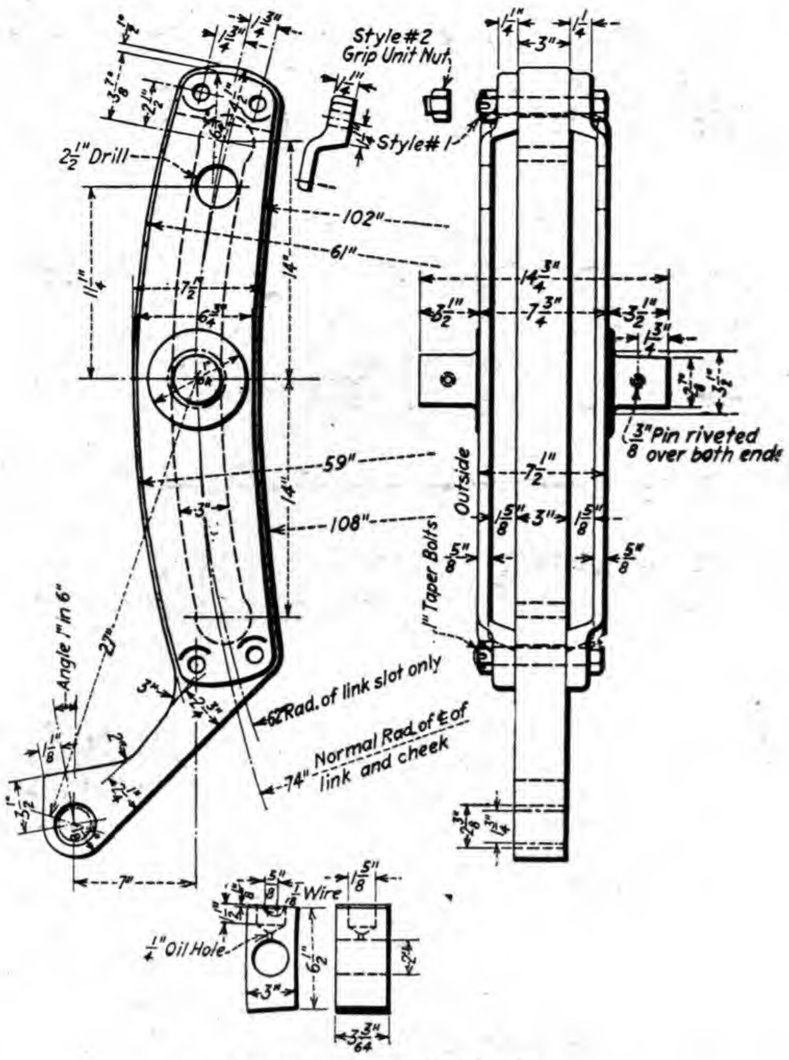


Union Link, C. B. & Q. 2-10-4 Type Locomotive.

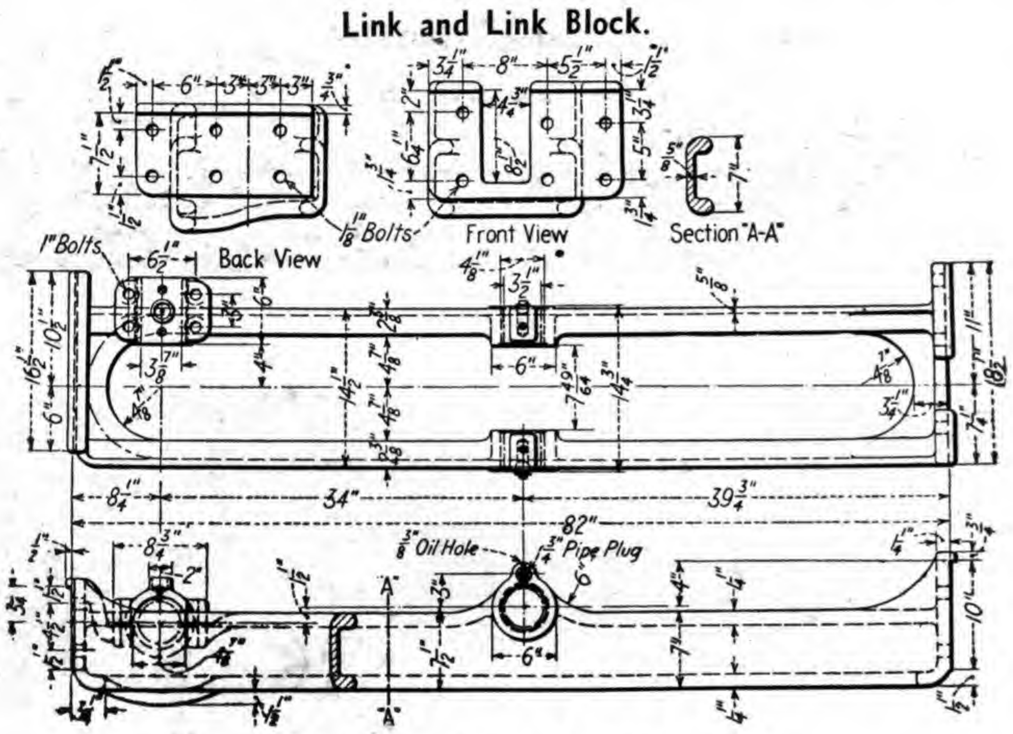


Eccentric Rod. American Locomotive Company.

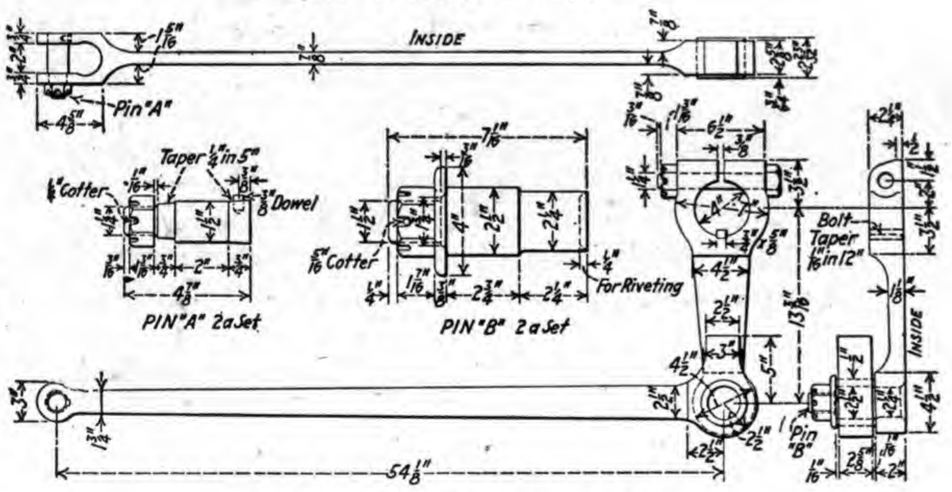
Details of Walschaerts Valve Gears



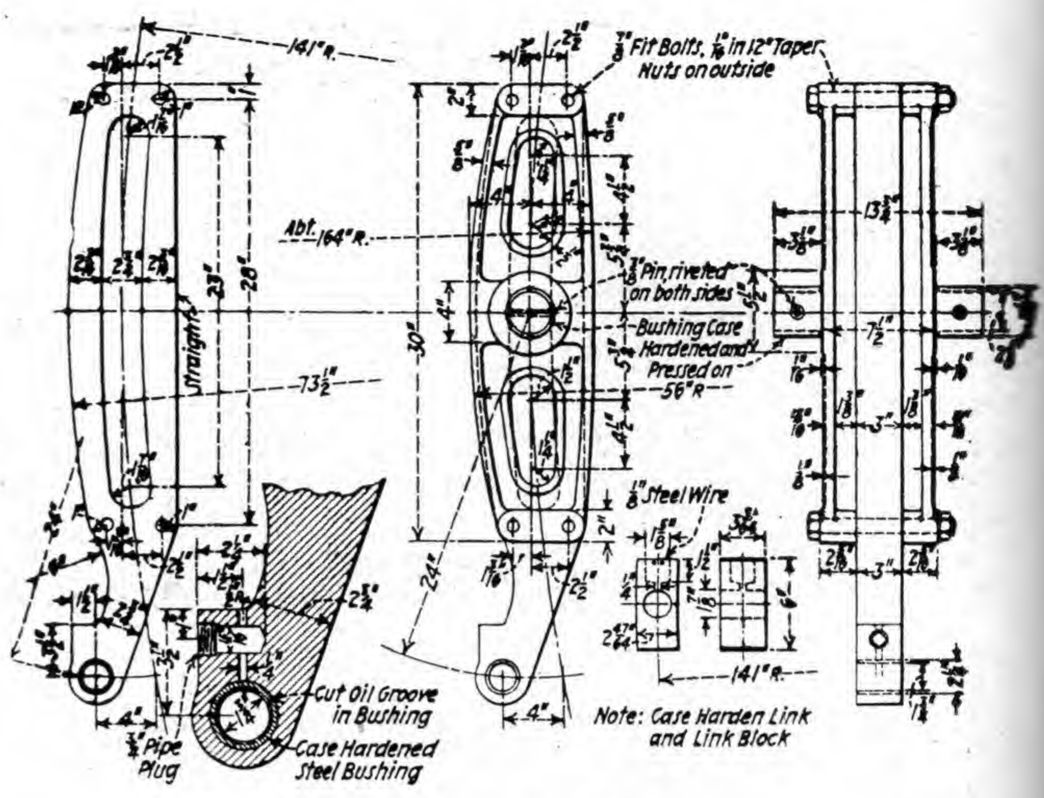
Link and Link Block.



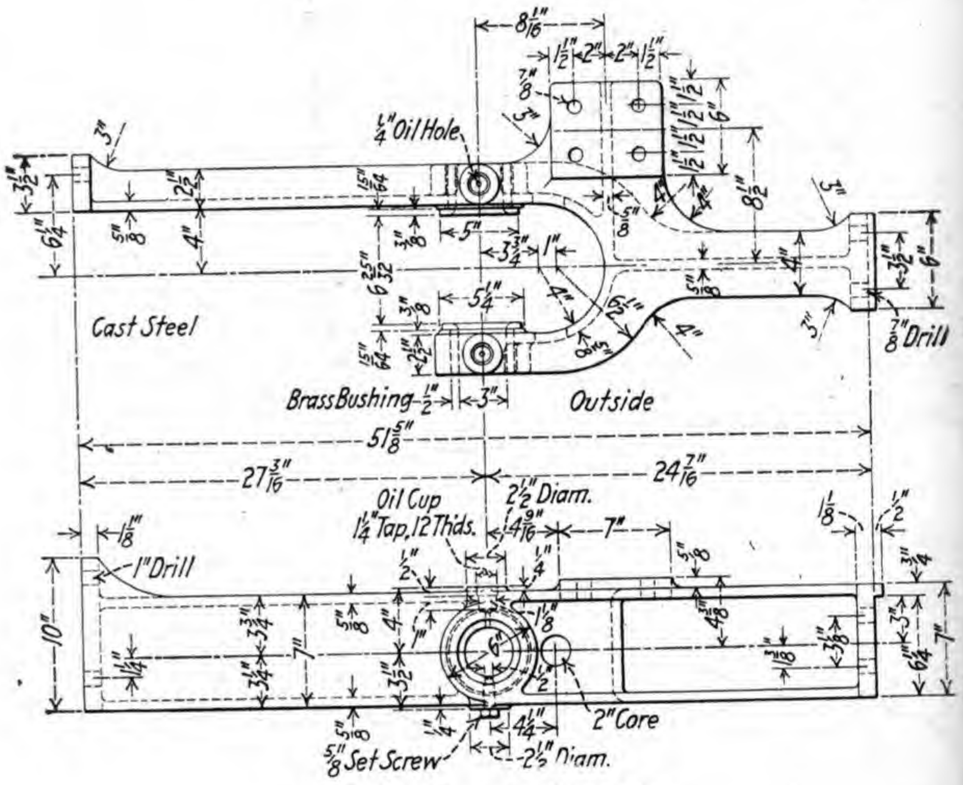
Link Bearing or Support.



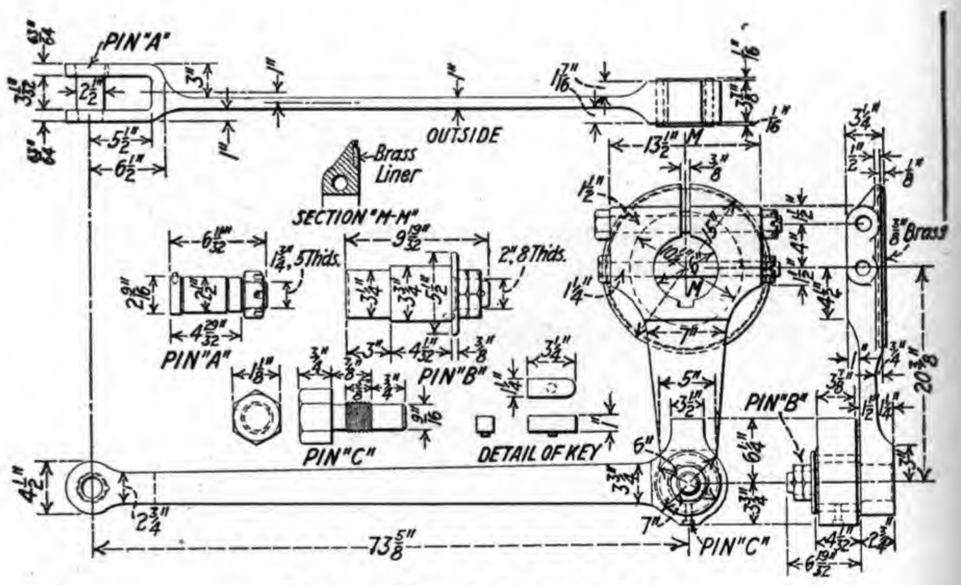
Eccentric Crank and Rod.



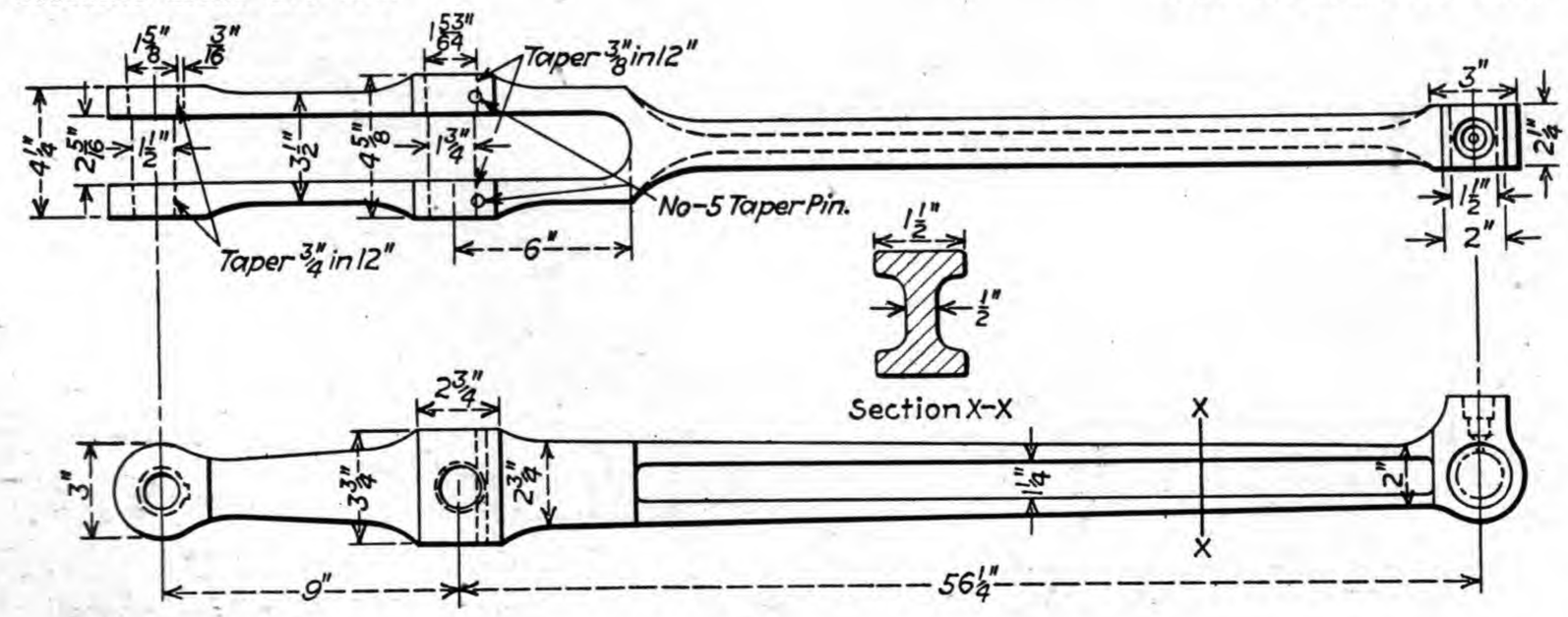
Link and Link Block.



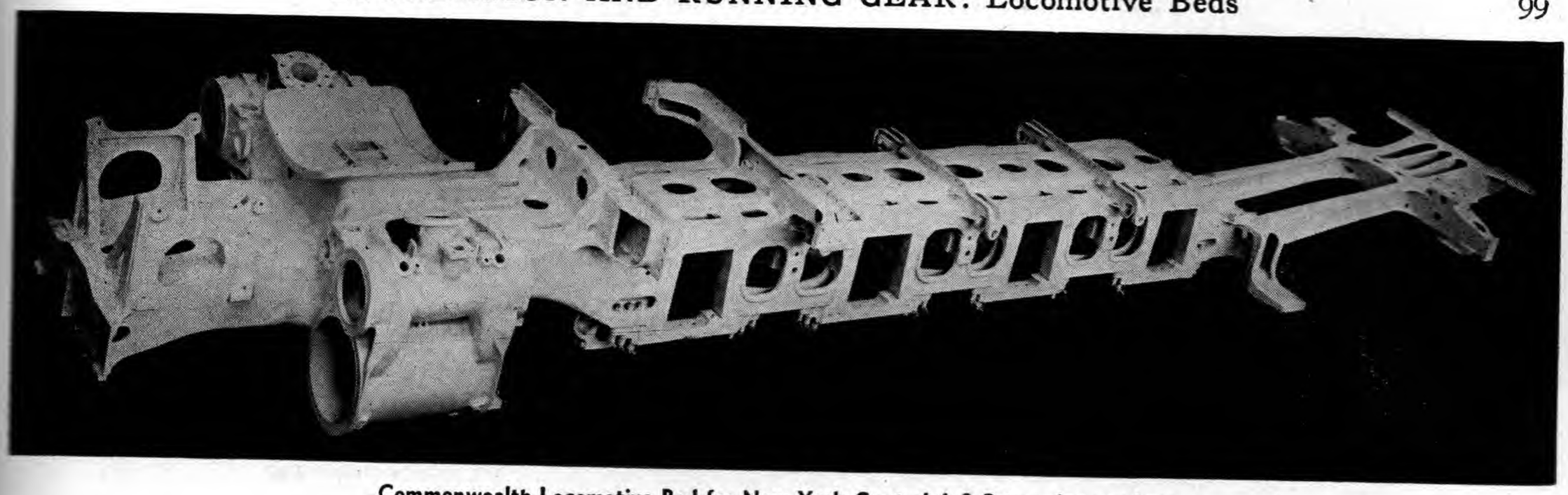
Link Bearing or Support.



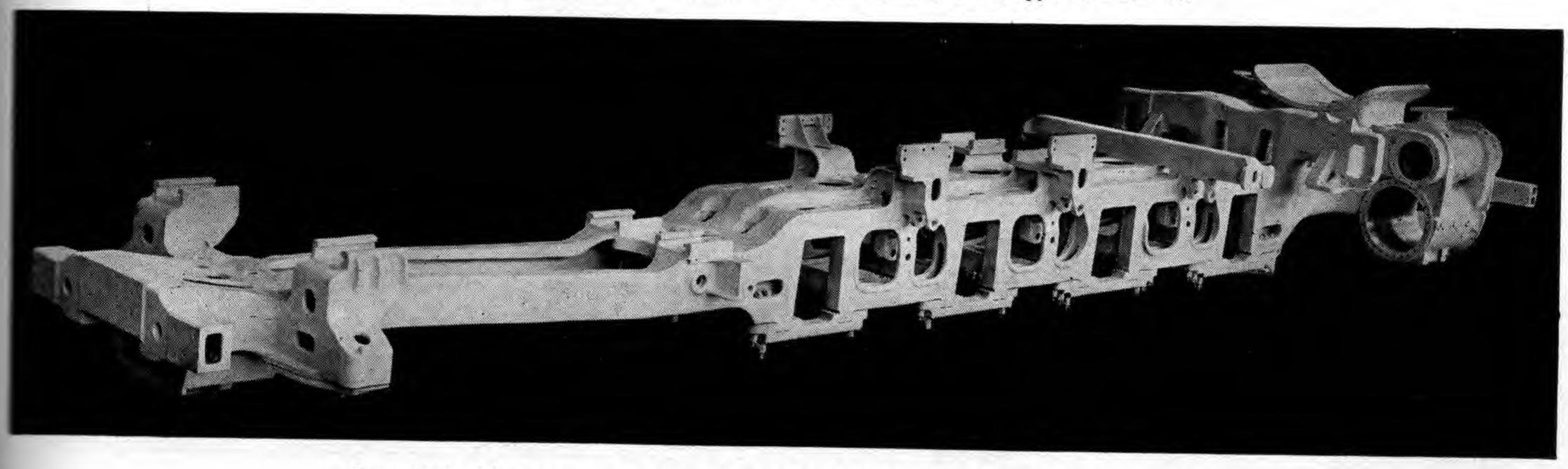
Eccentric Crank and Rod.



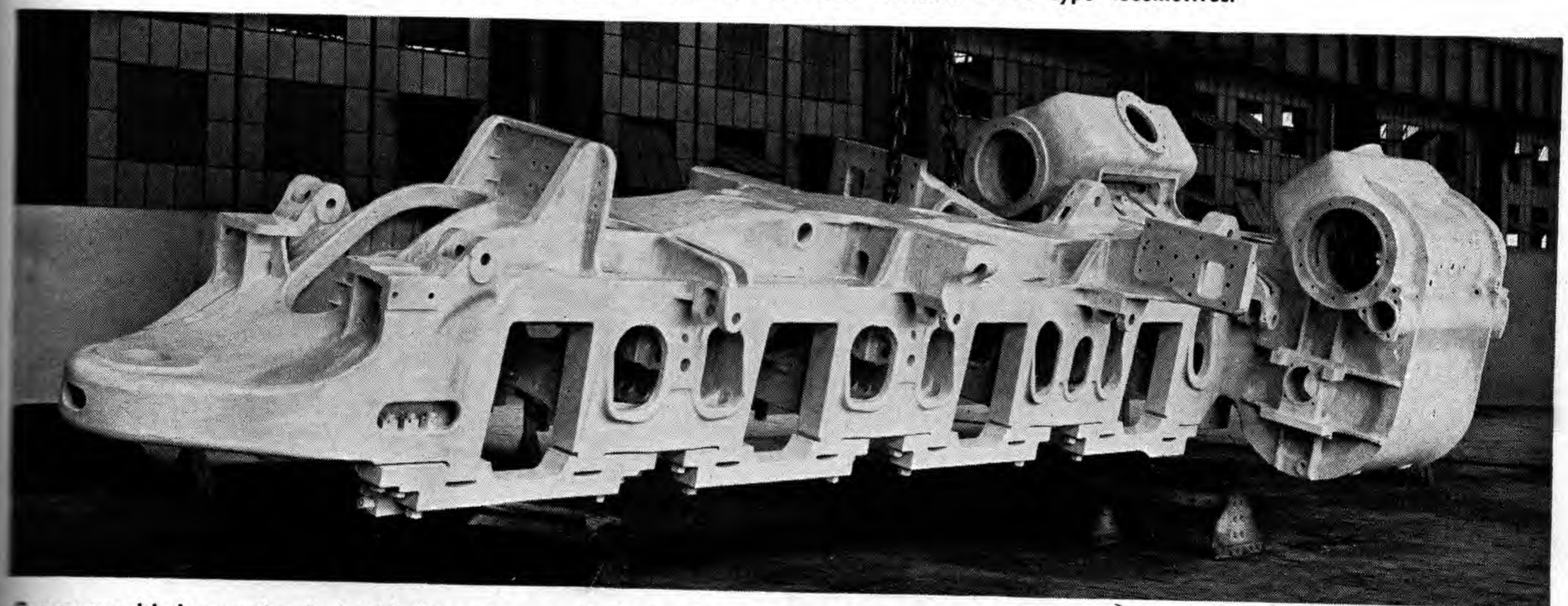
Link Motion Radius Bar. American Locomotive Company.



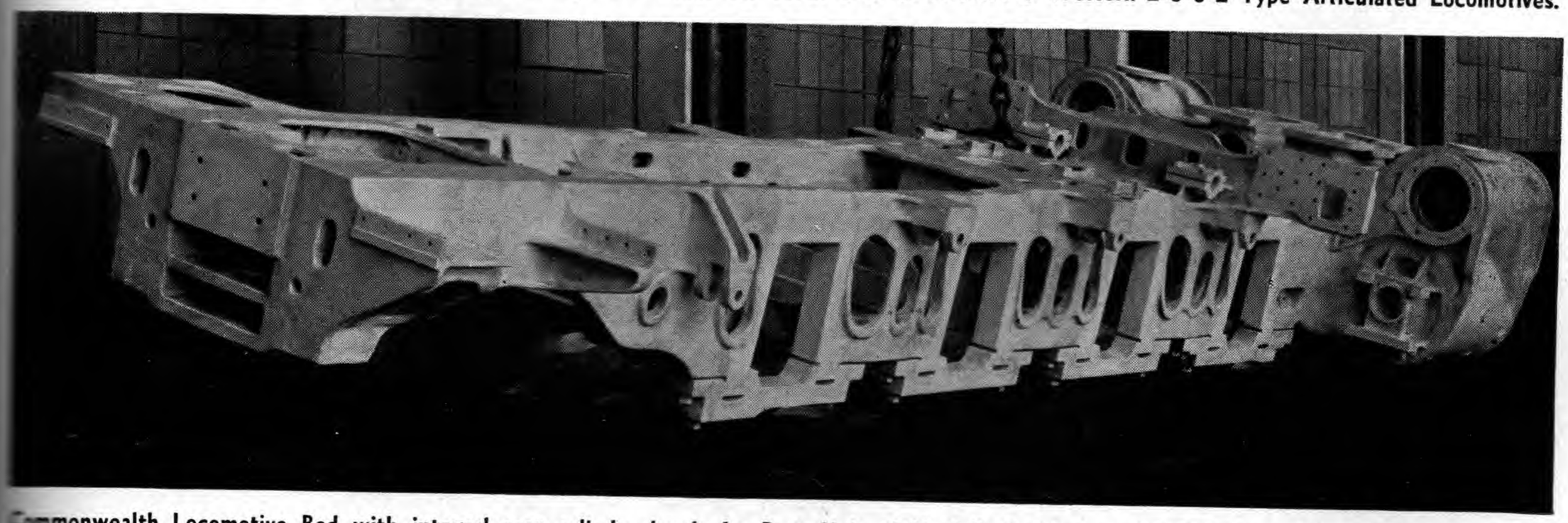
Commonwealth Locomotive Bed for New York Central 4-8-2 type locomotives.



Commonwealth Locomotive Bed for Canadian National 4-8-4 type locomotives.



Commonwealth Locomotive Bed with integral rear cylinder heads for Front Unit of Norfolk & Western 2-8-8-2 Type Articulated Locomotives.

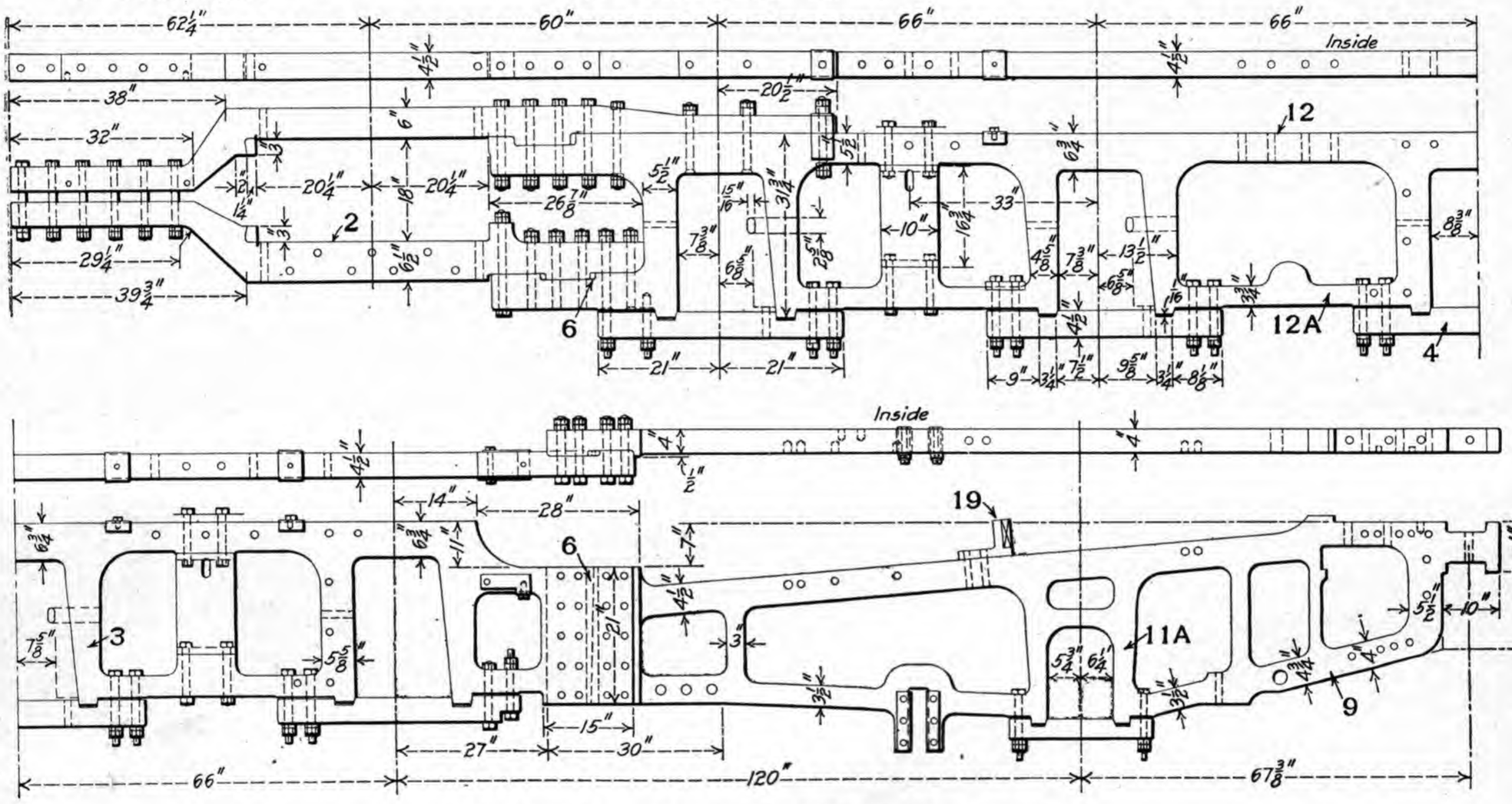


Commonwealth Locomotive Bed with integral rear cylinder heads for Rear Unit of Norfolk & Western 2-8-8-2 Type Articulated Locomotives.
General Steel Castings Corporation

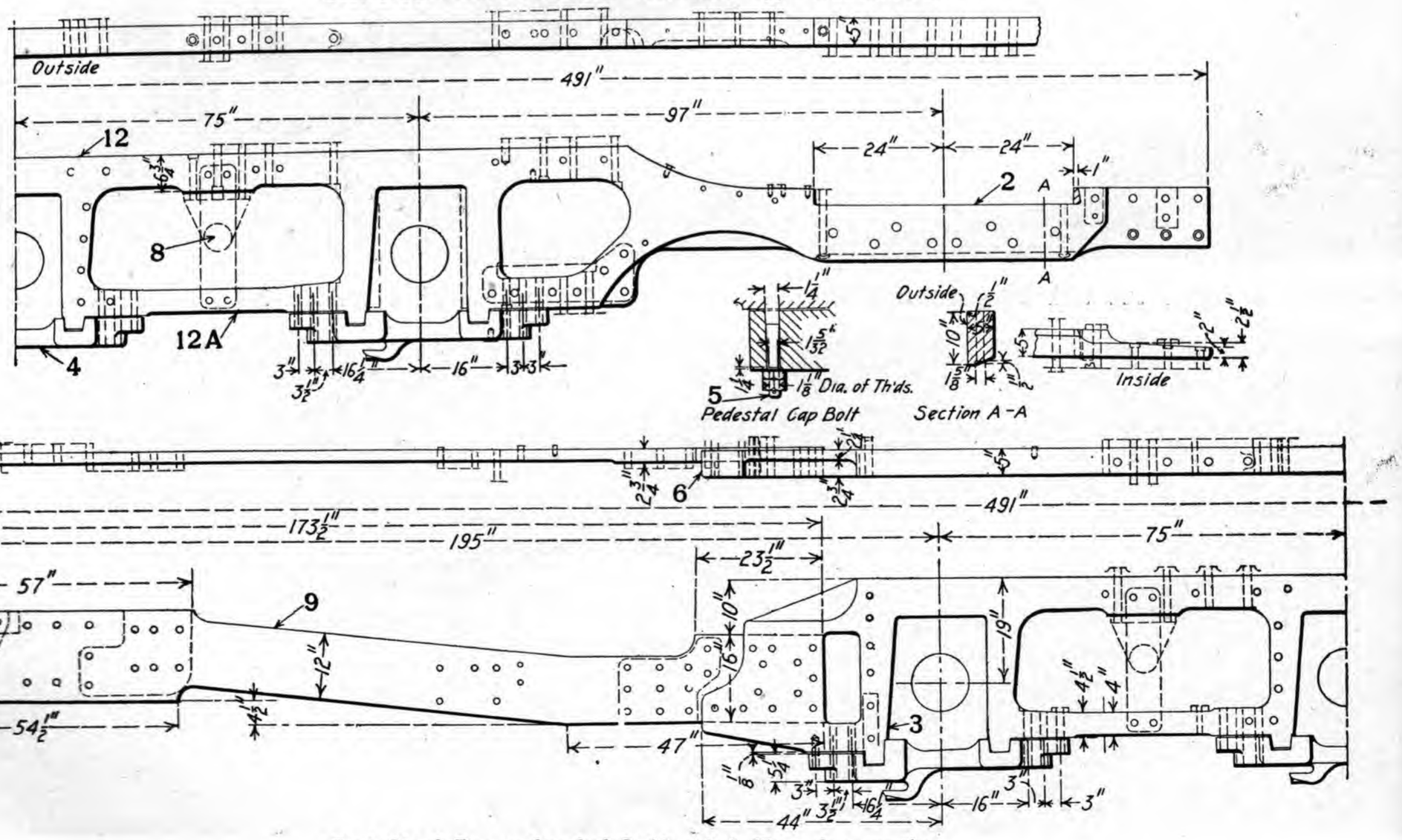
Cast Steel Main Engine Frame for 2-10-0 Type Locomotive. General Steel Castings Corporation.

Names of Parts of Locomotive Frames

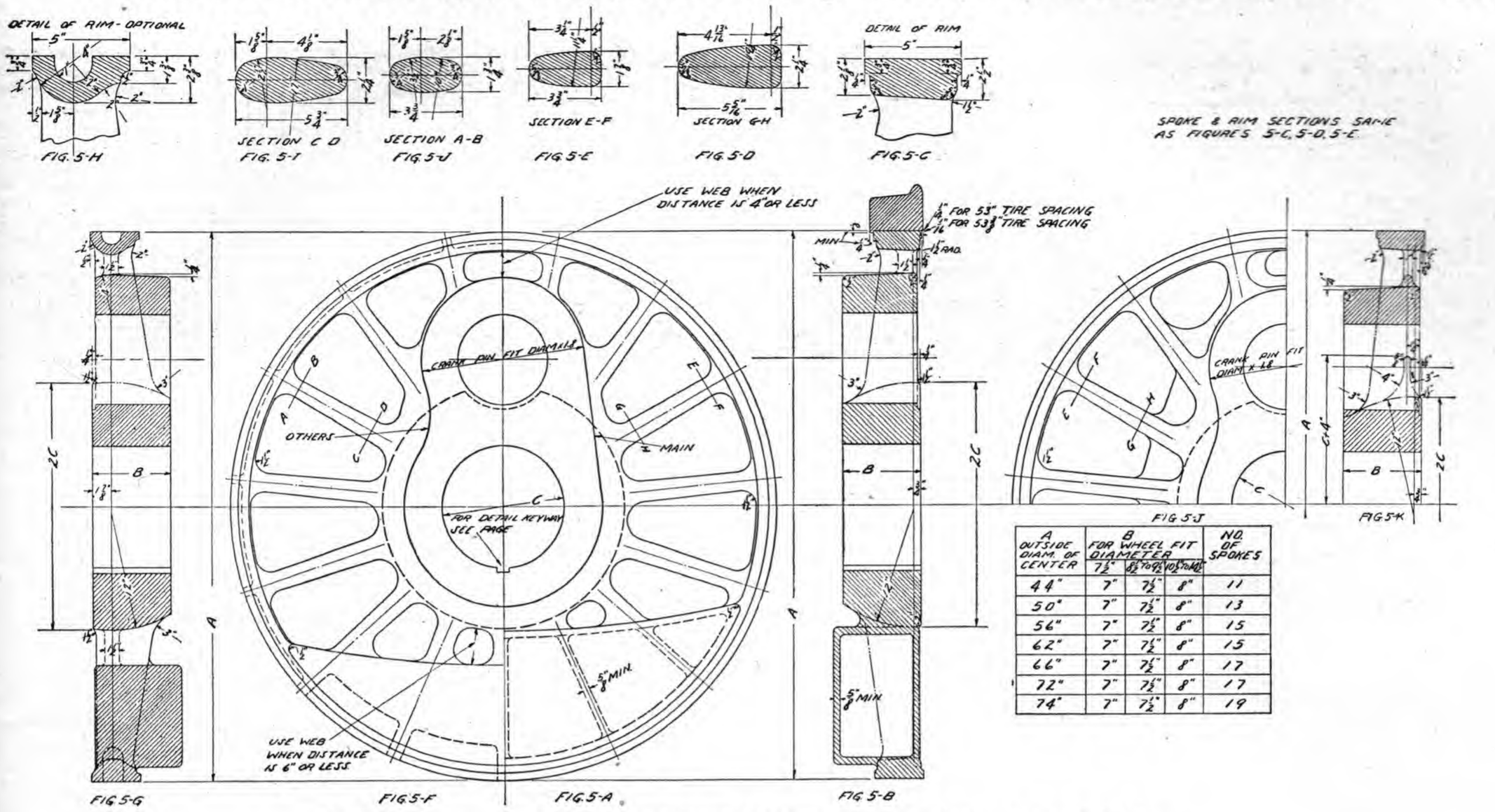
1 *Front End Slab*
2 *Cylinder Seat*
3 *Pedestal*
4 *Pedestal Brace, Binder or Cap*
5 *Pedestal Brace Bolt*
6 *Frame Splice*
7 *Frame Splice Key*
8 *Frame Filling or Equalizer Fulcrum*
9 *Rear Frame or Tail Piece*
10 *Rear Frame Separator*
11A *Trailing Truck Box Pedestal*
12 *Upper Frame Rail*
12A *Lower Frame Rail*
13 *Frame Crosstie*
16 *Reverse Shaft Bearing Box*
17 *Brake Lever Fulcrum Bracket*
19 *Expansion Pad Bracket*



Cast Steel Frame for 2-8-2 (Mikado) Type Locomotive.



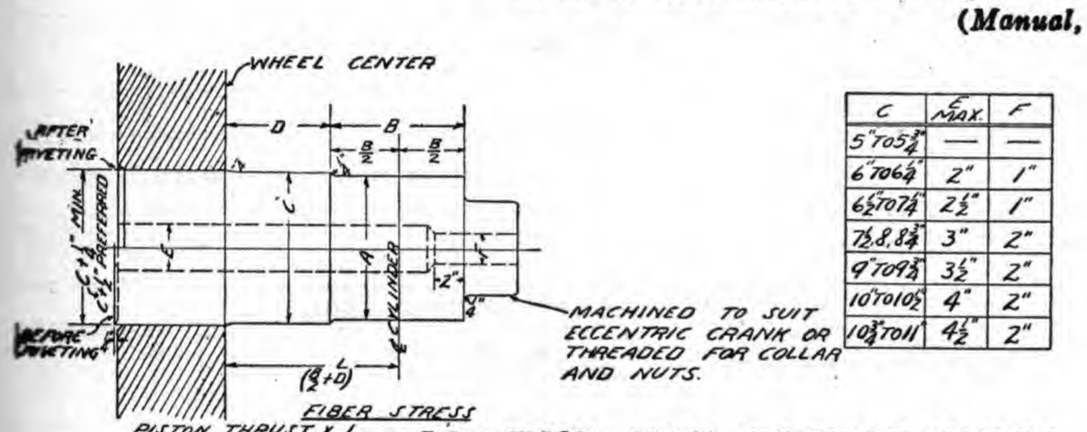
Cast Steel Frame for 4-6-2 (Pacific) Type Locomotive.



A OUTSIDE DIAM. OF CENTER	B FOR WHEEL FIT DIAMETER 7½"	8½ TO 9½"	10½ TO 11½"	NO. OF SPOKES
44"	7"	7½"	8"	11
50"	7"	7½"	8"	13
56"	7"	7½"	8"	15
62"	7"	7½"	8"	15
66"	7"	7½"	8"	17
72"	7"	7½"	8"	17
74"	7"	7½"	8"	19

A. A. R. Recommended Driving Wheel Centers of two designs. Adopted 1928.

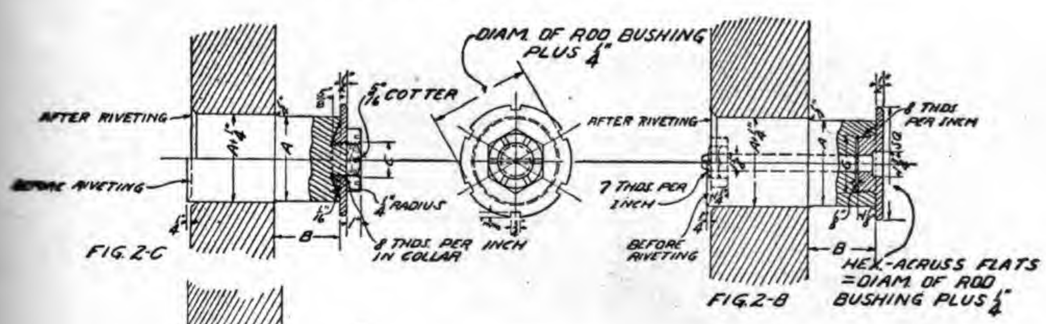
(*Manual, Page F-3*)


WHEEL CENTER
AFTER RIVETING
BEFORE RIVETING
MACHINED TO SUIT ECCENTRIC CRANK OR THREADED FOR COLLAR AND NUTS.
FIBER STRESS
PISTON THRUST X L / SECTION MODULUS = FIBER STRESS - SHOULD NOT EXCEED 16000 LBS. FOR STEEL CRANK PINS
SECTION MODULUS = { FOR SOLID PINS = .098 C³ ; FOR HOLLOW BORED PINS = .098(C⁴ - E⁴) / C
BEARING PRESSURES
PISTON THRUST / A x B = { BEARING PRESSURE ON MAIN ROD BEARING
"B" SHOULD NOT BE LESS THAN "A"
THRUST / C x D = { BEARING PRESSURE ON SIDE ROD BEARING
BEARING PRESSURES SHOULD NOT EXCEED 1600 LBS PER SQ. IN.
THRUST ON SIDE ROD BEARING EQUALS COMBINED THRUST ON ALL COUPLED CRANK PINS OTHER THAN MAIN. (SEE PLATE 2.)
HOLLOW BORING OF PINS IS OPTIONAL - HOLES "E" & "F" TO BE ACCORDING TO THE ABOVE TABLE IF USED

C	E MAX.	F
5" TO 5¾"	—	—
6" TO 6¼"	2"	1"
6½" TO 7¼"	2½"	1"
7½, 8, 8¾"	3"	2"
9" TO 9½"	3½"	2"
10" TO 10½"	4"	2"
10¾" TO 11"	4½"	2"

A. A. R. Recommended Main Crank Pins. Adopted 1928.

(*Manual, Page F-5 Plate 1*)

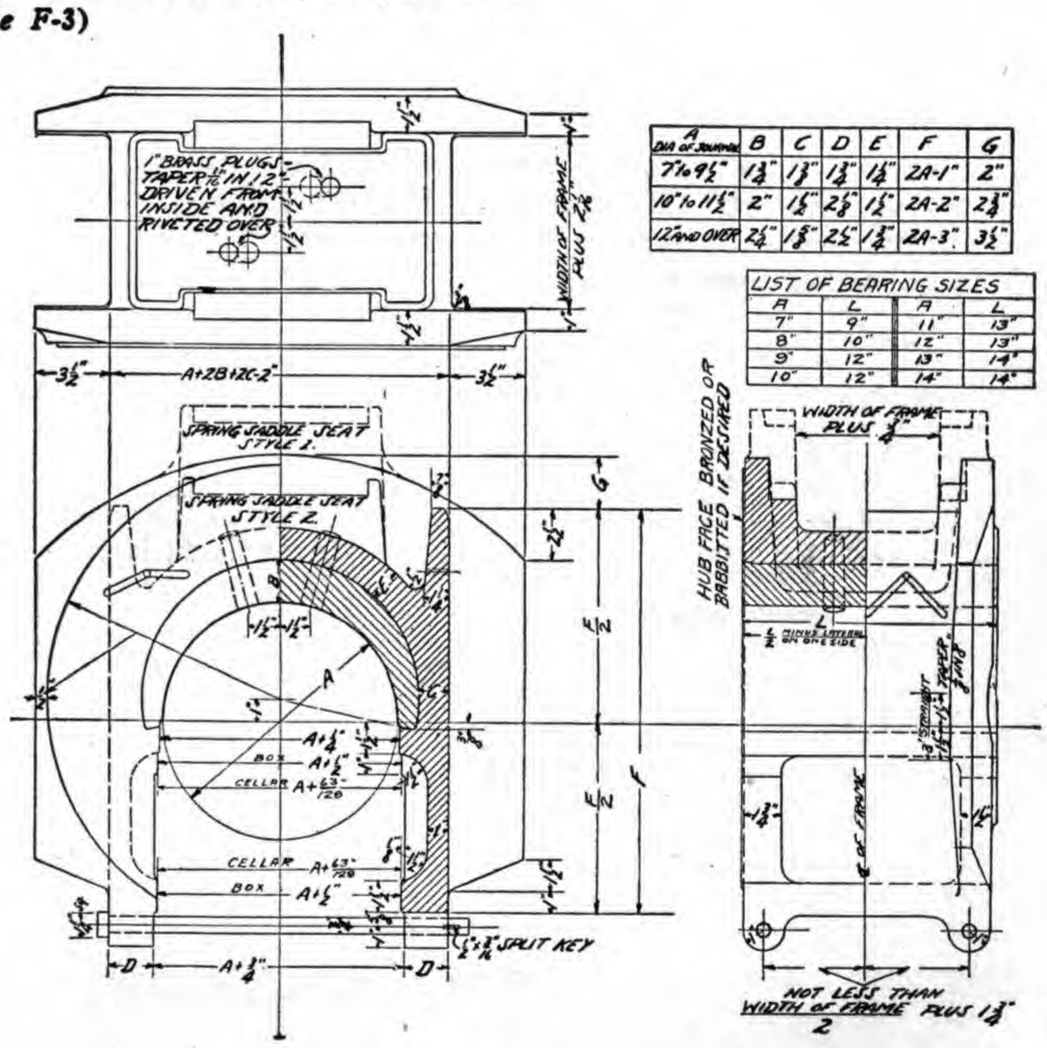


A.	C	D	E	F	G
3"	2"	⅝"	1¾"	2¼"	—
4"	2"	⅝"	1¾"	2¼"	—
5"	2½"	⅞"	2⅛"	2¾"	3½"
6"	2½"	⅞"	2⅛"	2¾"	4"
7"	3"	1⅛"	2½"	3¼"	4½"

FIBER STRESS
THRUST X 0.5B / SECTION MODULUS = { FIBER STRESS - SHOULD NOT EXCEED 10000 LBS.
THRUST = 0.3 WR / r
W = WEIGHT ON PAIR OF DRIVERS
R = RADIUS OF DRIVING WHEEL
r = RADIUS OF CRANK
SECTION MODULUS = 0.98 A³
NOTE:- SIZE OF CRANK PINS OTHER THAN MAIN IS GENERALLY GOVERNED BY BEARING PRESSURE
BEARING PRESSURE
THRUST AT B = BEARING PRESSURE - SHOULD NOT EXCEED 1600 LBS.

A. A. R. Recommended Crank Pins other than Main. Adopted 1928.

(*Manual, Page F-5 Plate 2*)


1" BRASS PLUGS TAPER ⅝" IN 12" DRIVEN FROM INSIDE AND RIVETED OVER
WIDTH OF FRAME PLUS 2"
A+2B+2C-2"
SPRING SADDLE SEAT STYLE 1.
SPRING SADDLE SEAT STYLE 2.
BOX A+¼"
BOX A+½"
CELLAR A+63"/128
CELLAR A+63"/128
BOX A+⅝"
¾"x⅜" SPLIT KEY
A+¾"
HUB FACE BRONZED OR BABBITTED IF DESIRED
WIDTH OF FRAME PLUS ¼"
NOT LESS THAN WIDTH OF FRAME PLUS 1¾"
2

A DIA OF JOURNAL	B	C	D	E	F	G
7" TO 9½"	1¾"	1⅜"	1¾"	1¼"	2A-1"	2"
10" TO 11½"	2"	1½"	2⅜"	1½"	2A-2"	2¾"
12" AND OVER	2¼"	1⅝"	2½"	1¾"	2A-3"	3½"

LIST OF BEARING SIZES			
A	L	A	L
7"	9"	11"	13"
8"	10"	12"	13"
9"	12"	13"	14"
10"	12"	14"	14"

A. A. R. Recommended Driving Boxes. Adopted 1928.

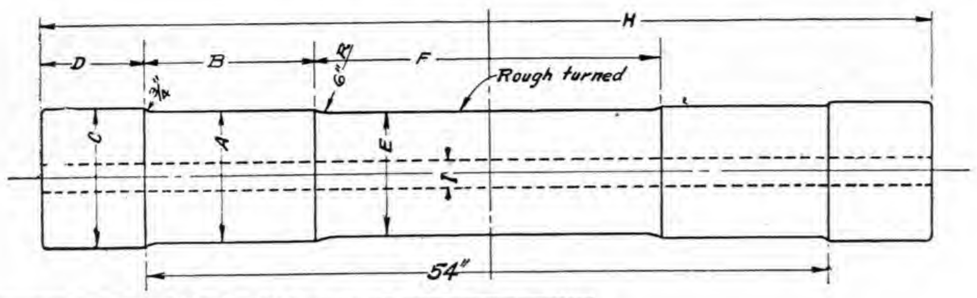
(*Manual, Page F-105 Plate 4*)

Driving Wheel Axles

For illustrations of A. A. R. Recommended Driving Axles see page 102.

Crank Pins

For text relative to A. A. R. Recommended Crank Pins see facing page.

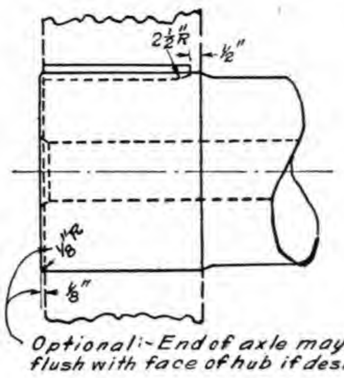


Bearing Sizes	A	B⊕	C	D⊕	E-Not Less Than	F⊕		H	I #	Max. Jnl. Load Pass.	Max. Jnl. Load Frt. & Sw.
7X9"	7"	10"	7½"	7"	6½"	34"		68"	-	11000	12600
8X10	8	11	8½	7½	7½	32		69	-	14000	16000
9X12	9	13	9½	7½	8½	28		69	-	18900	21600
10X12	10	13	10½	8	9½	28		70	2	21000	24000
11X13	11	14	11½	8	10½	26		70	3	25000	28600
12X13	12	14	12½	8	11½	26		70	3	27300	31200
13X14	13	15	13½	8	12½	24		70	4	31800	36400
14X14	14	15	14½	8	13½	24		70	4	34300	39200

⊕ These dimensions apply to main axles. Length of wheel fits and journals on axles other than main to be governed by corresponding dimensions of main axle.

Axles may be solid or bored to diameter shown.

Note:- If ends of axle are to project ⅛" beyond faces of hubs dimension (H) will be ¼" longer than shown in table.



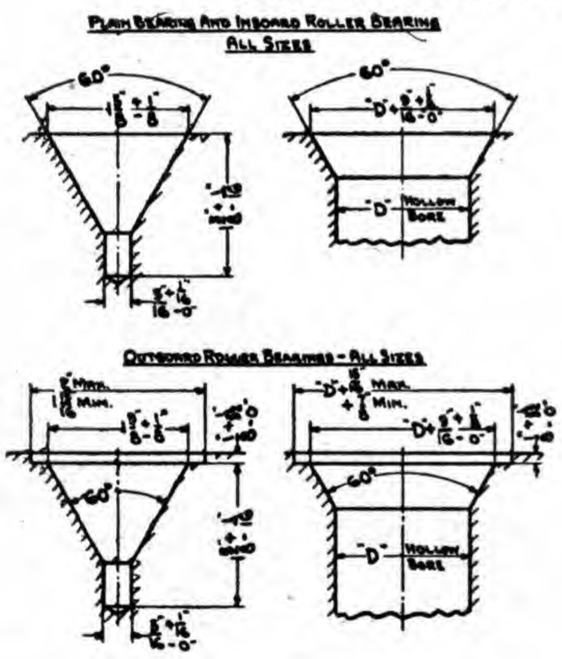
Optional:- End of axle may be flush with face of hub if desired.

P = Piston thrust in lbs.
Z = Modulus of circular or annular section having outside diameter equal to (d)
FS = Fiber Stress.
$\frac{P(B+C)}{2XZ} = FS = 23000$ Maximum for steel axles.

Formula for calculating Stresses in axles.

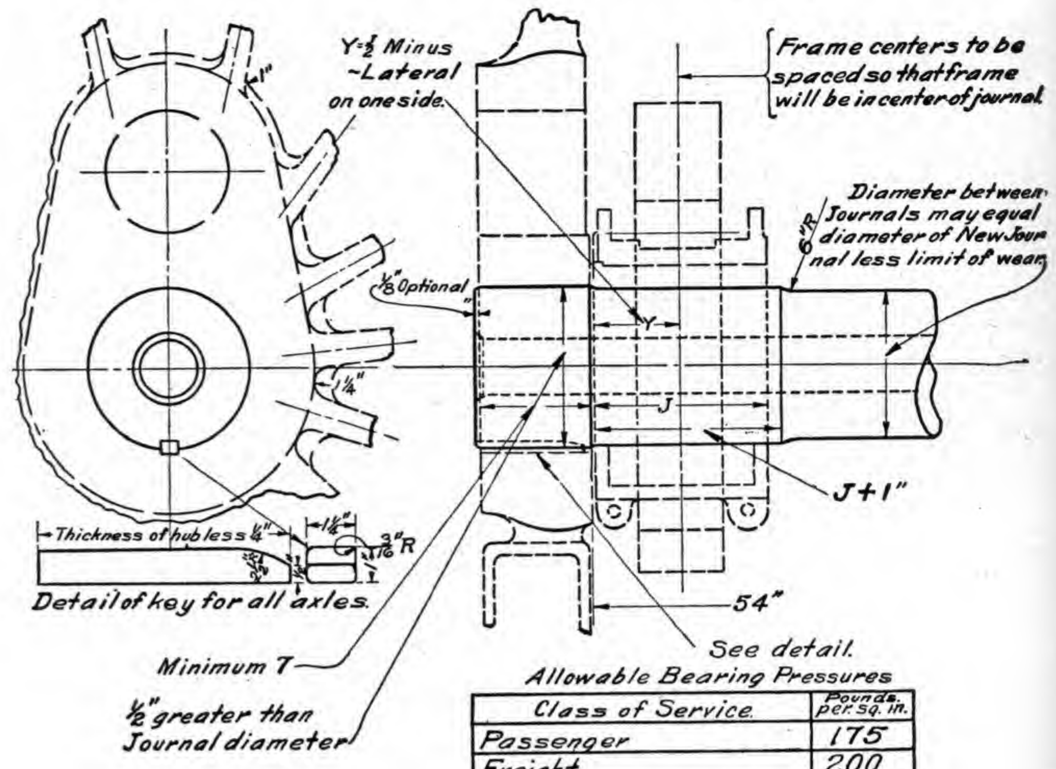
A. A. R. recommended sizes of driving axles. Adopted 1927, Corrected 1946, 1947, 1948.

(*Manual, following Page F-100*)



A. A. R. Locomotive Axle Centering. Adopted 1940

(*Manual, Page F-102A*)



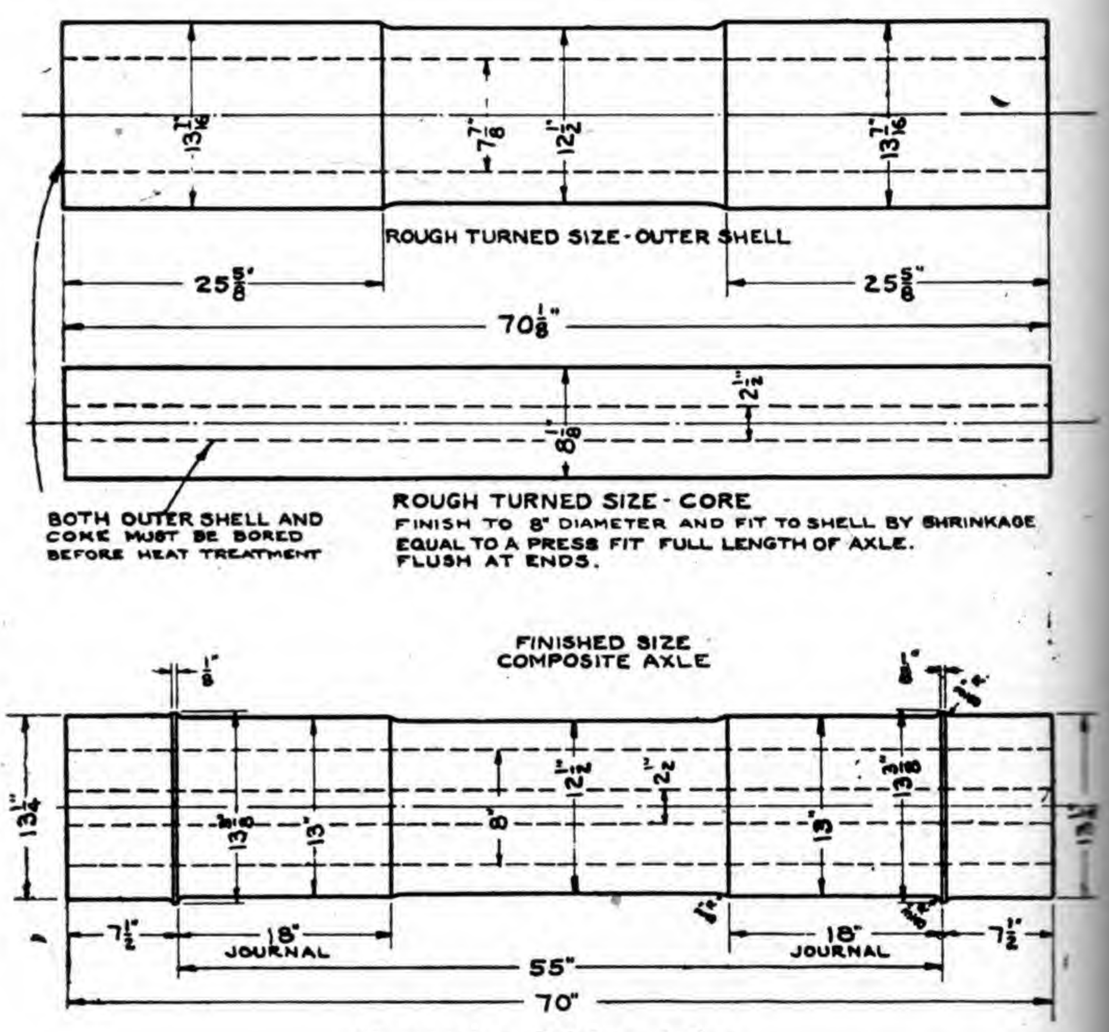
Allowable Bearing Pressures

Class of Service.	Pounds per Sq. In.
Passenger	175
Freight	200
Switch	200

A. A. R. Recommended Driving Axles. Adopted 1927.

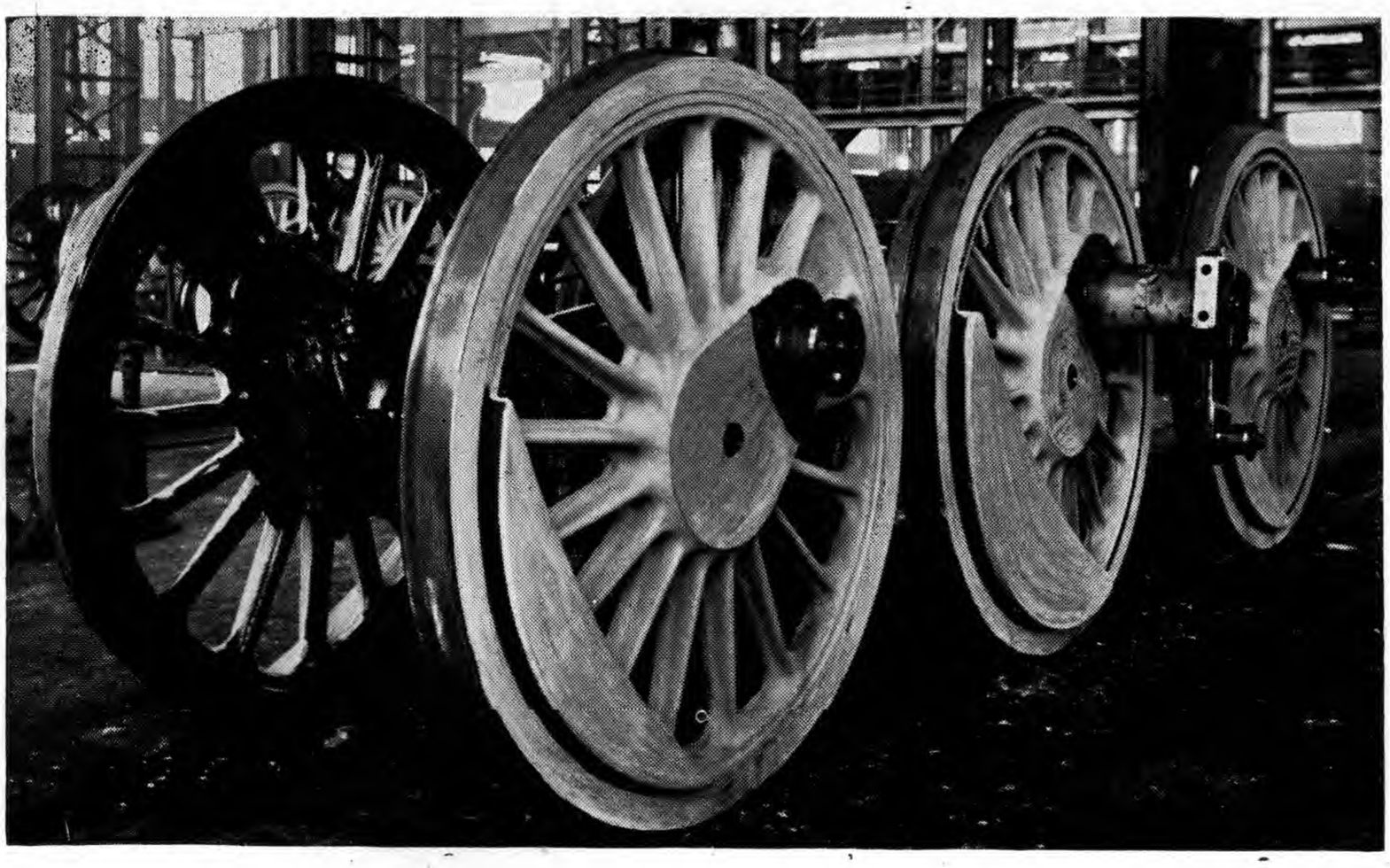
(*See Manual, Page F-99*)

Note.—For Recommended Driving Wheel Centers see Page 101

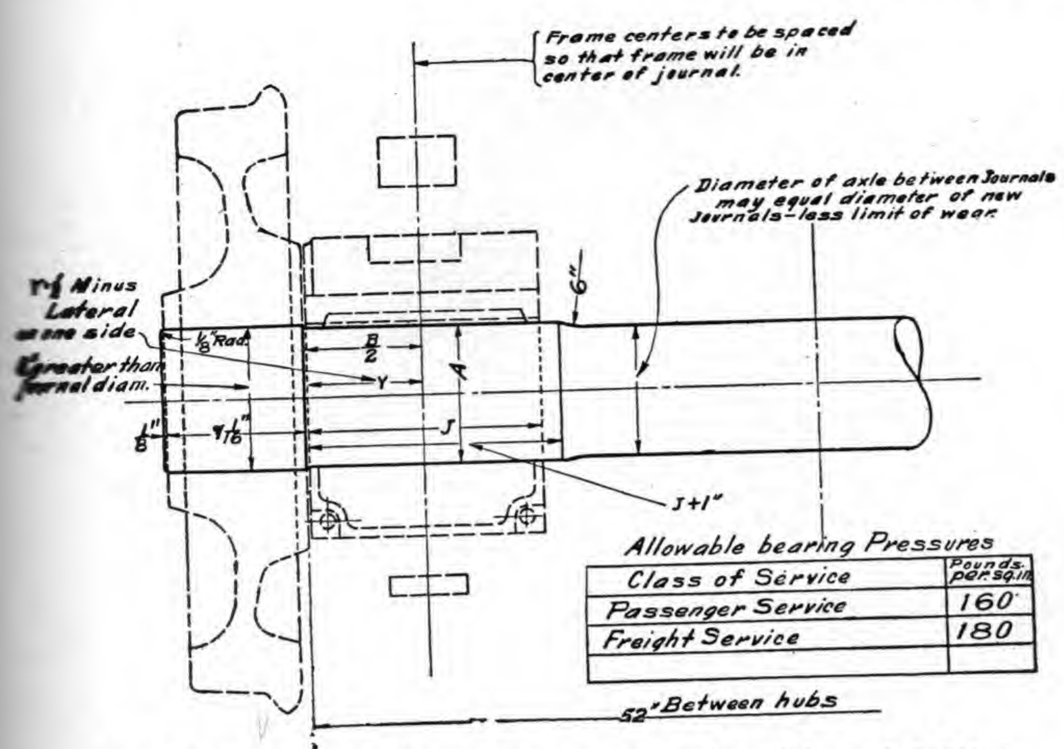

13 1/16"
7 7/8"
12 1/2"
7 13/16"
ROUGH TURNED SIZE - OUTER SHELL
25 5/8"
25 5/8"
70 1/8"
2 1/2"
8 1/8"
BOTH OUTER SHELL AND CORE MUST BE BORED BEFORE HEAT TREATMENT
ROUGH TURNED SIZE - CORE
FINISH TO 8" DIAMETER AND FIT TO SHELL BY SHRINKAGE EQUAL TO A PRESS FIT FULL LENGTH OF AXLE. FLUSH AT ENDS.

Composite Driving Axles.

(*Report, A.A.R. Committee on Locomotive Construction*)



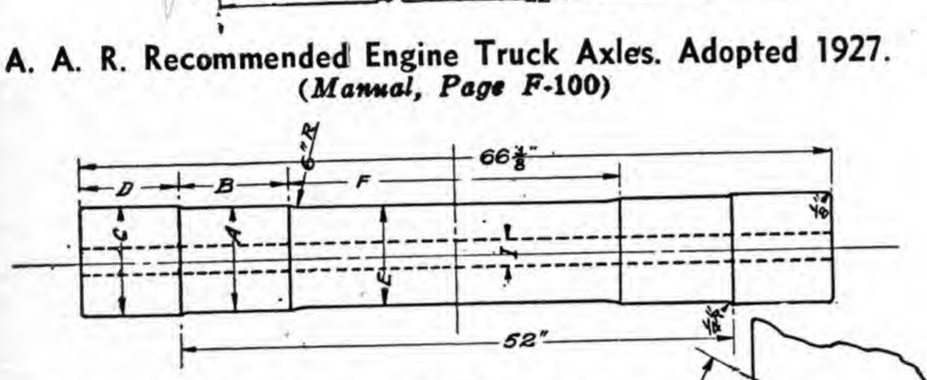
Driving wheels for 4-6-4 type locomotive. Wheels are of the spoke type with reinforcing ribs—Timken double-roller type journal bearings have two-piece housings.


Frame centers to be spaced so that frame will be in center of journal.
Diameter of axle between Journals may equal diameter of new Journals—less limit of wear.
Minus Lateral on one side
Greater than journal diam.
1/8" Rad.
6"
J+1"
52" Between hubs

Allowable bearing Pressures

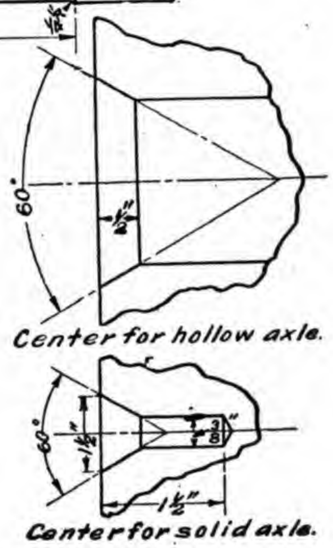
Class of Service	Pounds per sq.in.
Passenger Service	160
Freight Service	180

A. A. R. Recommended Engine Truck Axles. Adopted 1927.
(Manual, Page F-100)

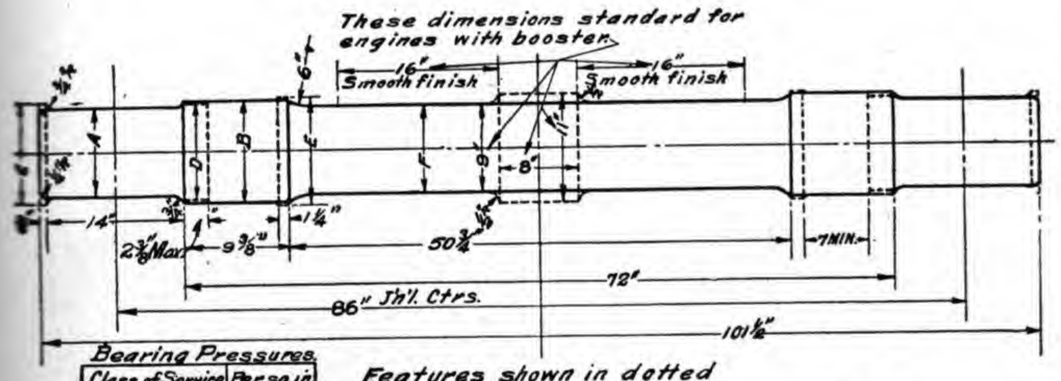


Bearing Sizes	A	B	C	D	E-NOT LESS THAN	F			I#	MAX. J'N'L LOAD PASS.	MAX. J'N'L LOAD Freight
5"X9"	5"	10"	5 1/4"	7 3/16	4 1/2"	32"			~	7200	8100
6X10	6	11	6 1/4	7 3/16	5 1/2"	30			~	9600	10800
6 1/2 X11	6 1/2	12	6 3/4	7 3/16	6"	28			~	11400	12900
7X12	7	13	7 1/4	7 3/16	6 1/2"	26			~	13400	15100
7 1/2 X13	7 1/2	14	7 3/4	7 3/16	7"	24			2"	15600	17600
8X14	8	15	8 1/4	7 3/16	7 1/2"	22			2	17900	20200

*Axles may be solid or bored, at option of purchaser.



A. A. R. Recommended Sizes of Engine Truck Axles. Adopted 1927.
(Manual, Page F-101)

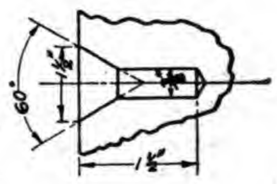


Bearing Pressures

Class of Service	Per sq.in.
Passenger	200 lbs.
Freight	210 lbs.

Features shown in dotted lines are optional.

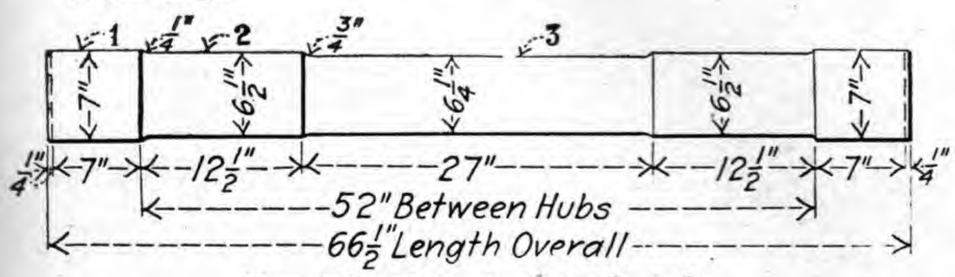
Bearing Sizes	A	B	C	D	E	F#	Max. J'n'l. load Passenger	Max. J'n'l. load Freight
7"X14"	7"	8 3/8	8 1/4"	8 1/4"	8 5/8"	7 1/2"	19600	20600
8"X14"	8"	9 3/8	9 1/4"	9 1/4"	9 5/8"	8 1/2"	22400	23500
9"X14"	9"	10 3/8	10 1/4	10 1/4	10 5/8"	9 1/2"	25200	26500



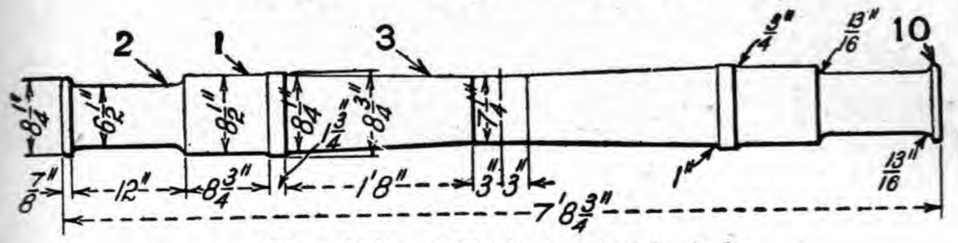
*This dimension applies to Non Booster axles only. Non Booster axles to be Rough turned between wheel fits.

A. A. R. Recommended Sizes of Axles for Two-Wheel Trailing Trucks. Adopted 1927.
(Manual, Page 102)

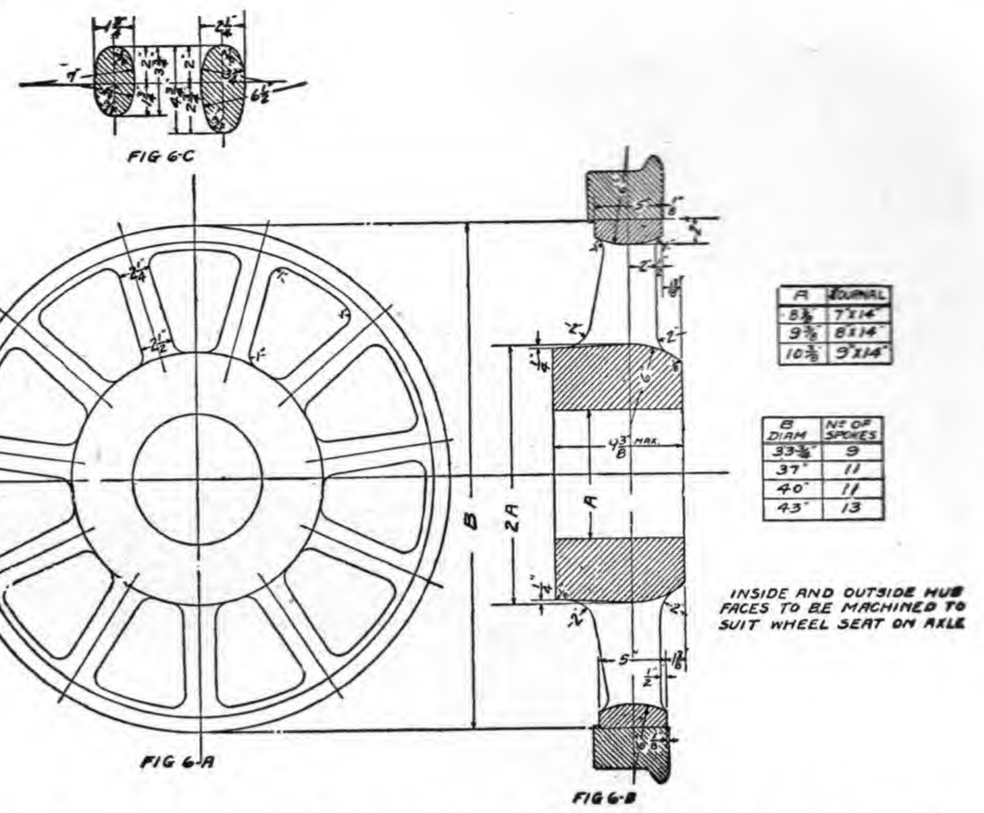
For 7 in. by 13 in. and 7½ in. by 14 in. Axles see 1944 Proceedings.



Two-Wheel Engine Truck Axle.



Two-Wheel Trailing Truck Axle.



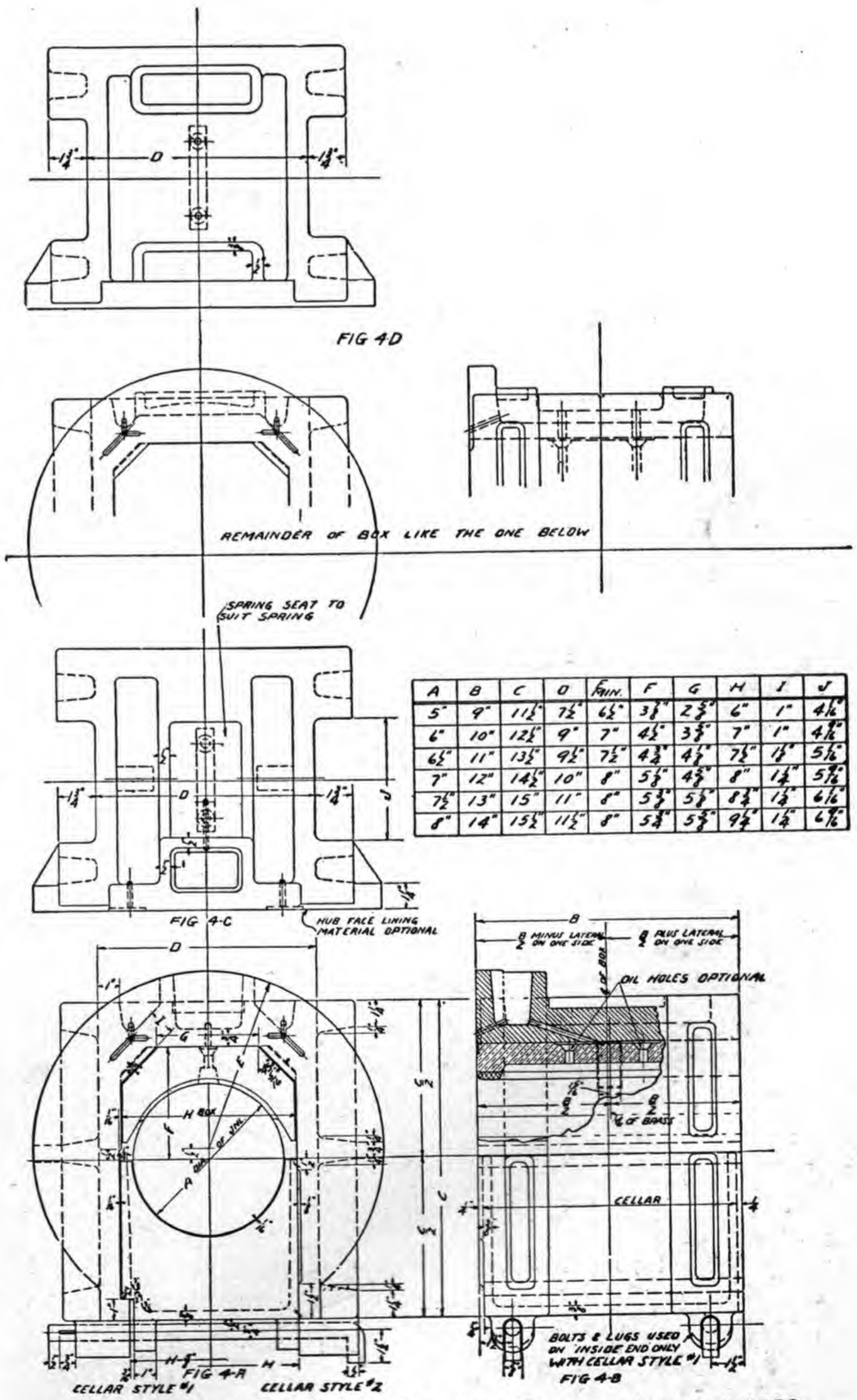
A	JOURNAL
8 1/2	7"X14"
9 3/8	8X14"
10 3/8	9"X14"

B DIAM	NO. OF SPOKES
33 3/8"	9
37"	11
40"	11
43"	13

A. A. R. Recommended Trailer Wheel with Cast Steel Centers. Adopted 1928.

(Manual, Page F-3 and Plate 6)

***Note:** For Recommended Pressures for Mounting Axles See Manual, Page F-129*

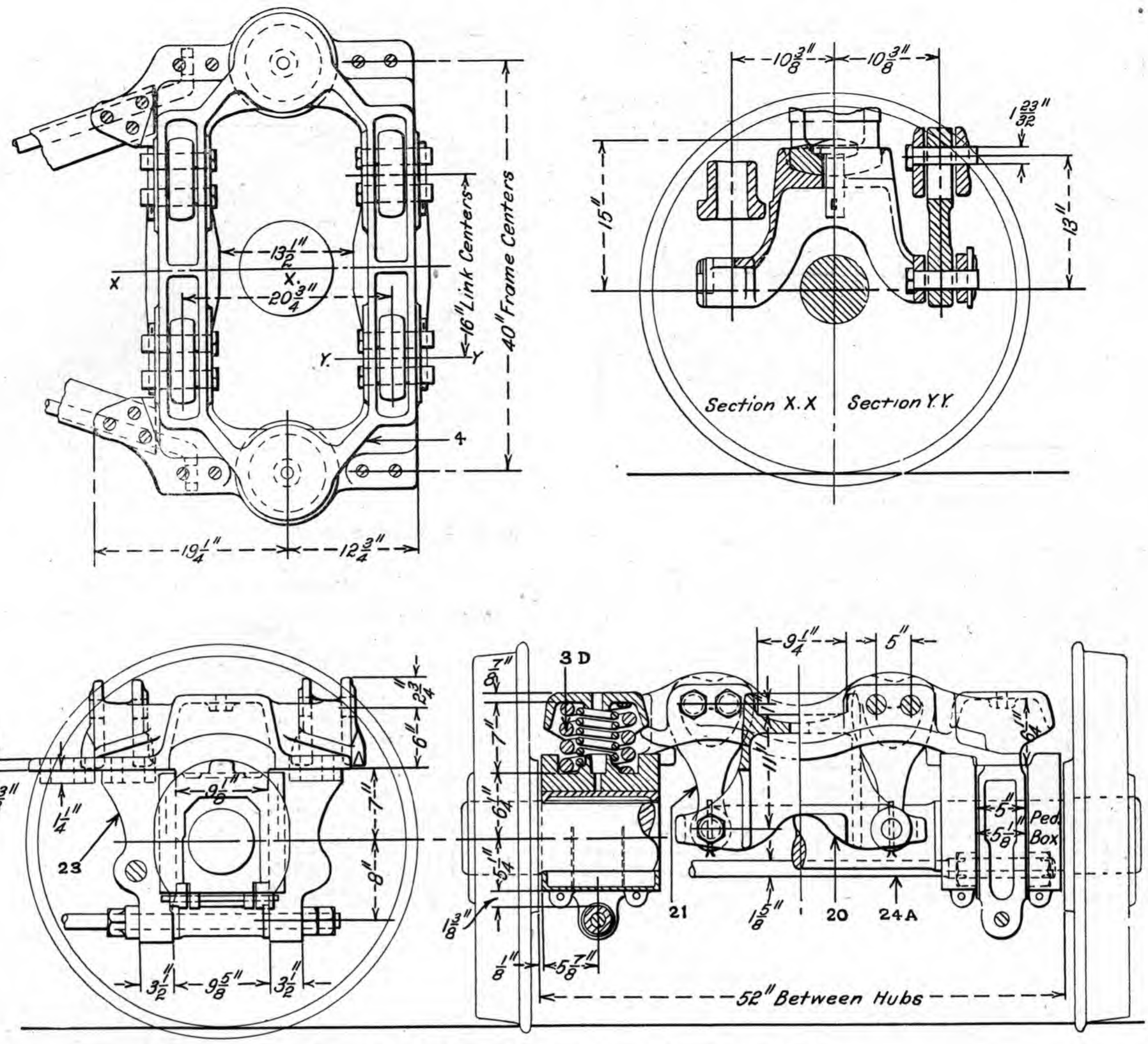


A	B	C	D	F MIN.	F	G	H	I	J
5"	9"	11 1/2"	7 1/2"	6 1/2"	3 3/8"	2 3/8"	6"	1"	4 1/4"
6"	10"	12 1/2"	9"	7"	4 1/2"	3 3/8"	7"	1"	4 1/4"
6 1/2"	11"	13 1/2"	9 1/2"	7 1/2"	4 3/4"	4 3/8"	7 1/2"	1 1/2"	5 1/16"
7"	12"	14 1/2"	10"	8"	5 3/8"	4 3/8"	8"	1 1/2"	5 9/16"
7 1/2"	13"	15"	11"	8"	5 3/8"	5 3/8"	8 1/2"	1 1/2"	6 1/16"
8"	14"	15 1/2"	11 1/2"	8"	5 3/8"	5 3/8"	9 1/2"	1 1/2"	6 1/16"

A. A. R. Recommended Engine Truck Boxes. Adopted 1928.

Names of Parts of Trucks

1 *Wheel Seat*
2 *Journal or Bearing*
3 *Center*
10 *Collar*

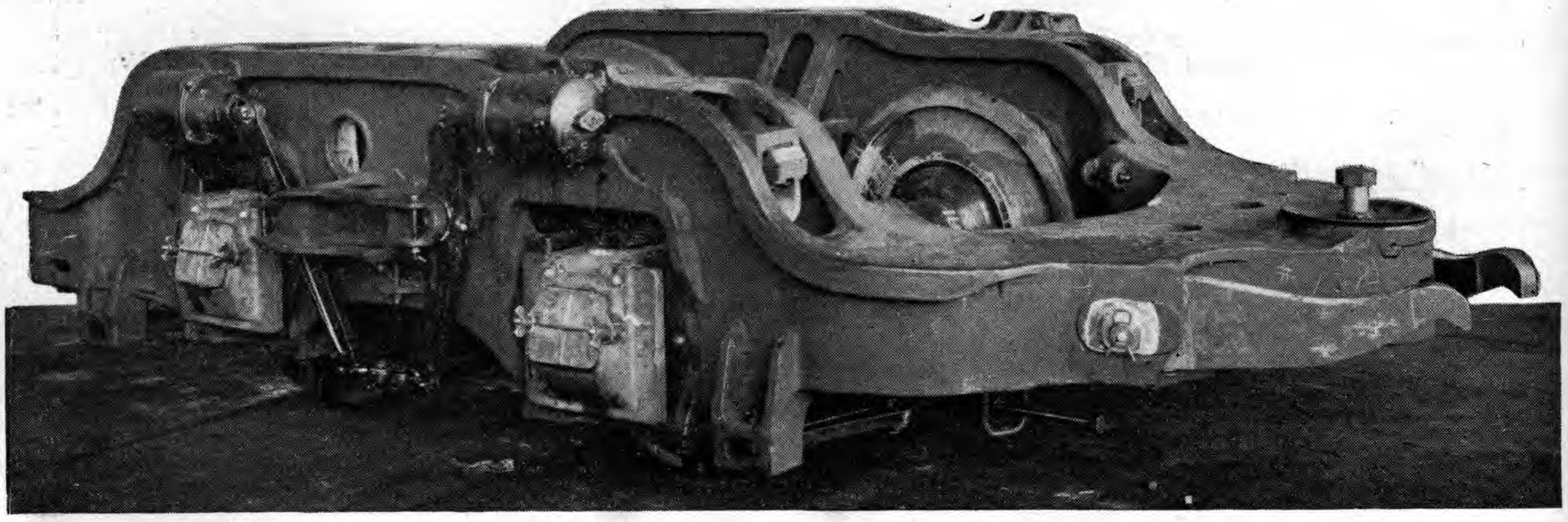


General Drawing of Two-Wheel Leading Truck.

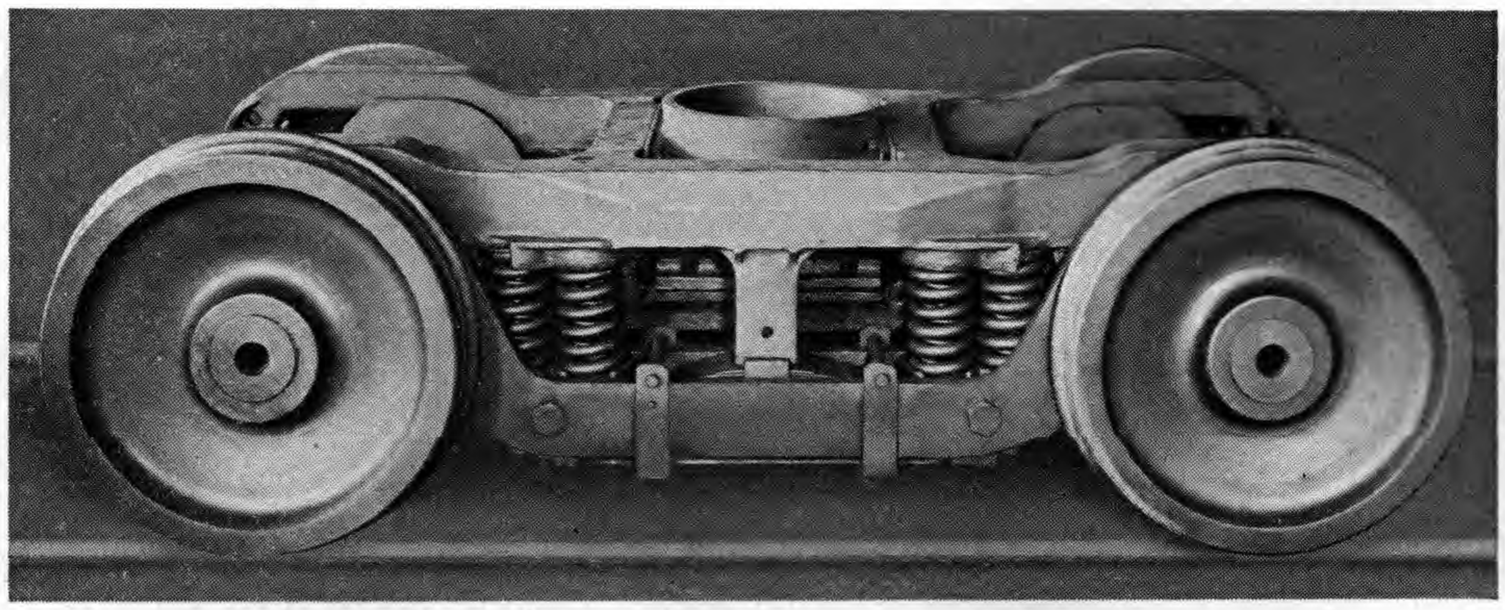
Details of Two-Wheel Leading Engine Truck for 2-8-2 (Mikado) Type Locomotive.

Names of Parts of Trucks

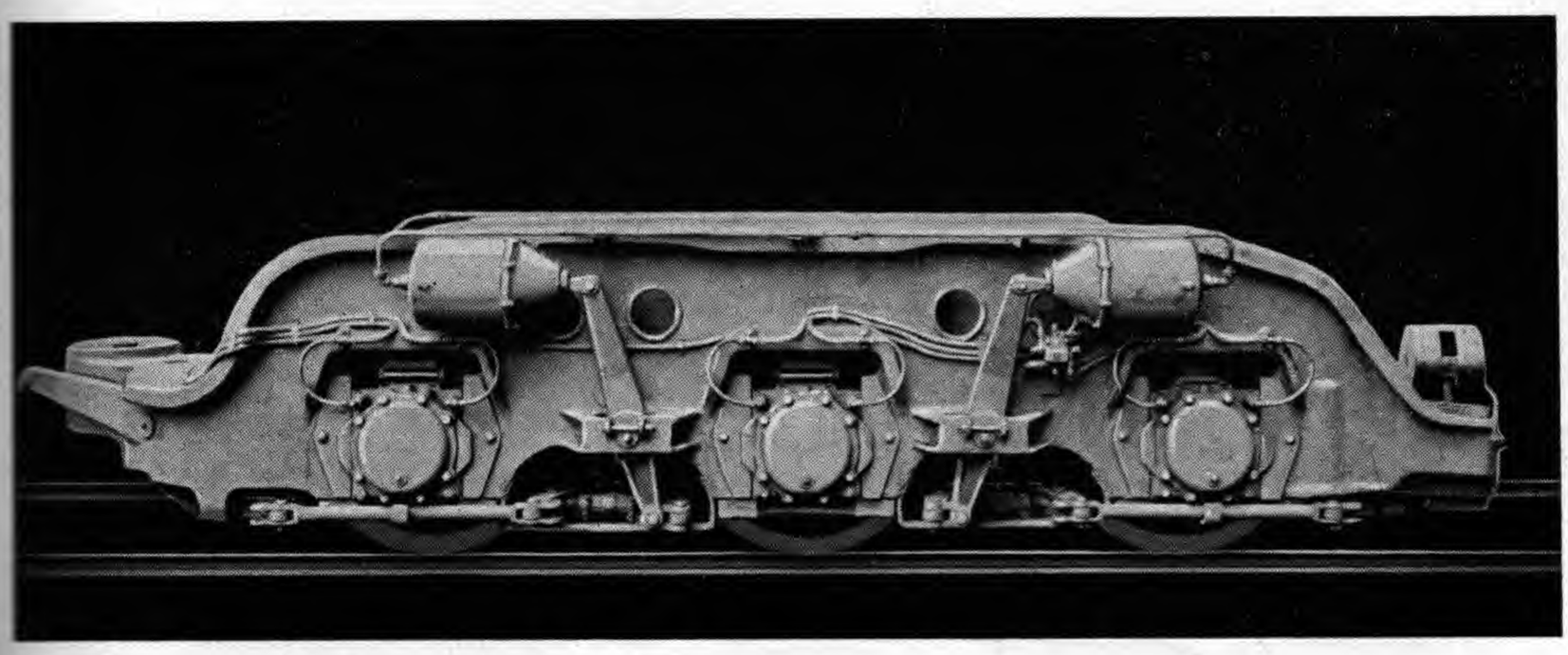
1	*Truck Wheel*	8	*Center Bolt*	18	*Driver Spring Hanger*
2	*Truck Axle*	9	*Driver and Truck Equalizer*	19	*Equalizer Safety Strap*
3	*Journal Box*	10	*Radius Bar*	20	*Swing Bolster*
3A	*Journal Box Bolt*	11	*Radius Bar Brace*	21	*Swing Link*
3B	*Journal Box Bolt Tie Bar*	12	*Radius Bar Fulcrum*	23	*Pedestal*
3D	*Journal Box Spring*	13	*Radius Bar Crosstie*	24	*Pedestal Tie Bar*
4	*Truck Frame or Swing Link Frame*	14	*Transverse Equalizer*	24A	*Pedestal Cross Brace*
5	*Center Pin*	15	*Truck Spring*	25	*Swing Link Pin*
6	*Center Pin Cap*	16	*Truck Spring Hanger*	26	*Journal Box Yoke*
7	*Center Pin Guide*	17	*Engine Frame*		



Commonwealth Four-Wheel Delta Type Trailer Truck arranged for clasp brakes. General Steel Castings Corporation.

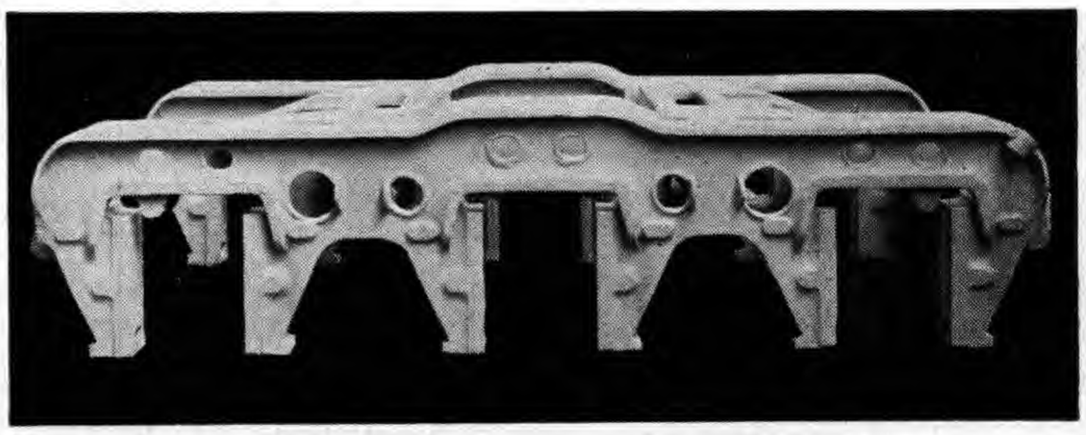


Four-Wheel Engine Truck with Coil and Semi-Elliptic Springs and Roller Centering Device as furnished for S.L. & S. W. 4-8-4 Type Locomotives.

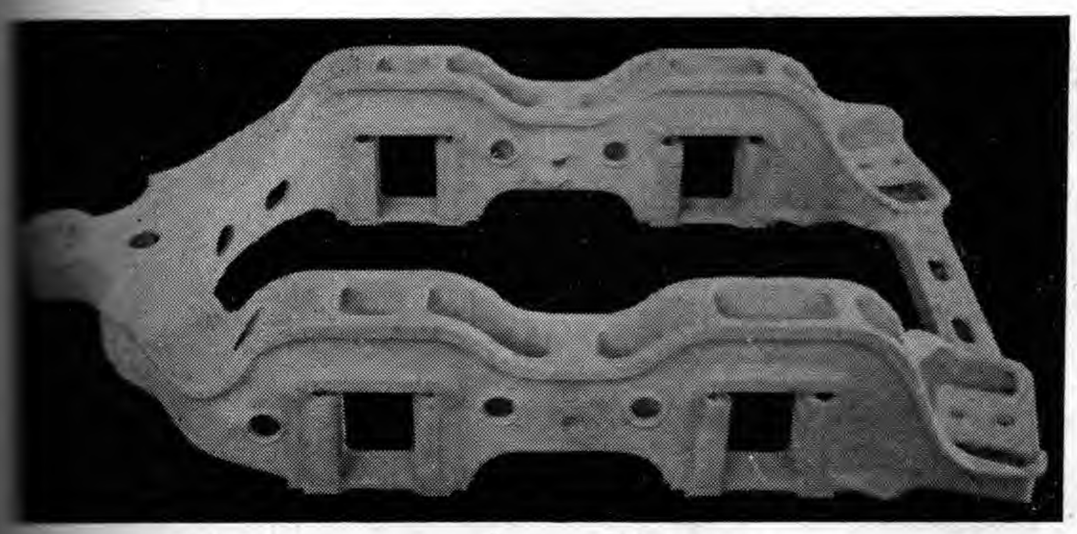


Cast Steel Six-Wheel Delta Type Trailing Truck with one-piece cast steel frame as furnished for Pennsylvania Railroad 6-4-4-6 Type, Class S-1 Locomotive.

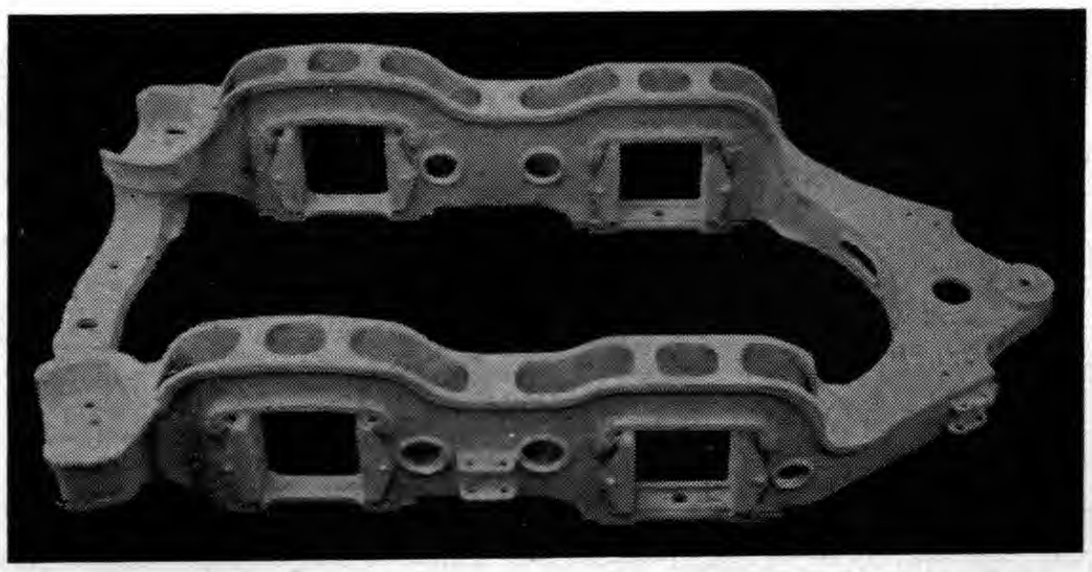
Commonwealth Two-Wheel Trailer Truck Frames as furnished for Belgian State Railways 4-6-2 Type Locomotives.



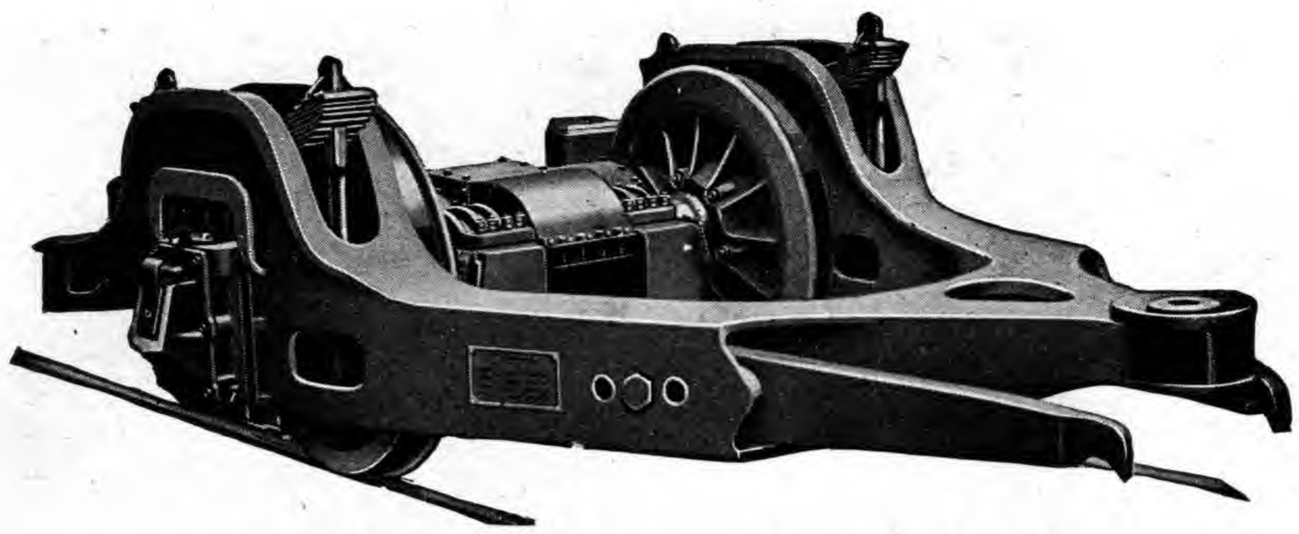
Commonwealth Six-Wheel Engine Truck Frame for Pennsylvania Railroad 6-4-4-6 Type, Class S-1, Locomotive.



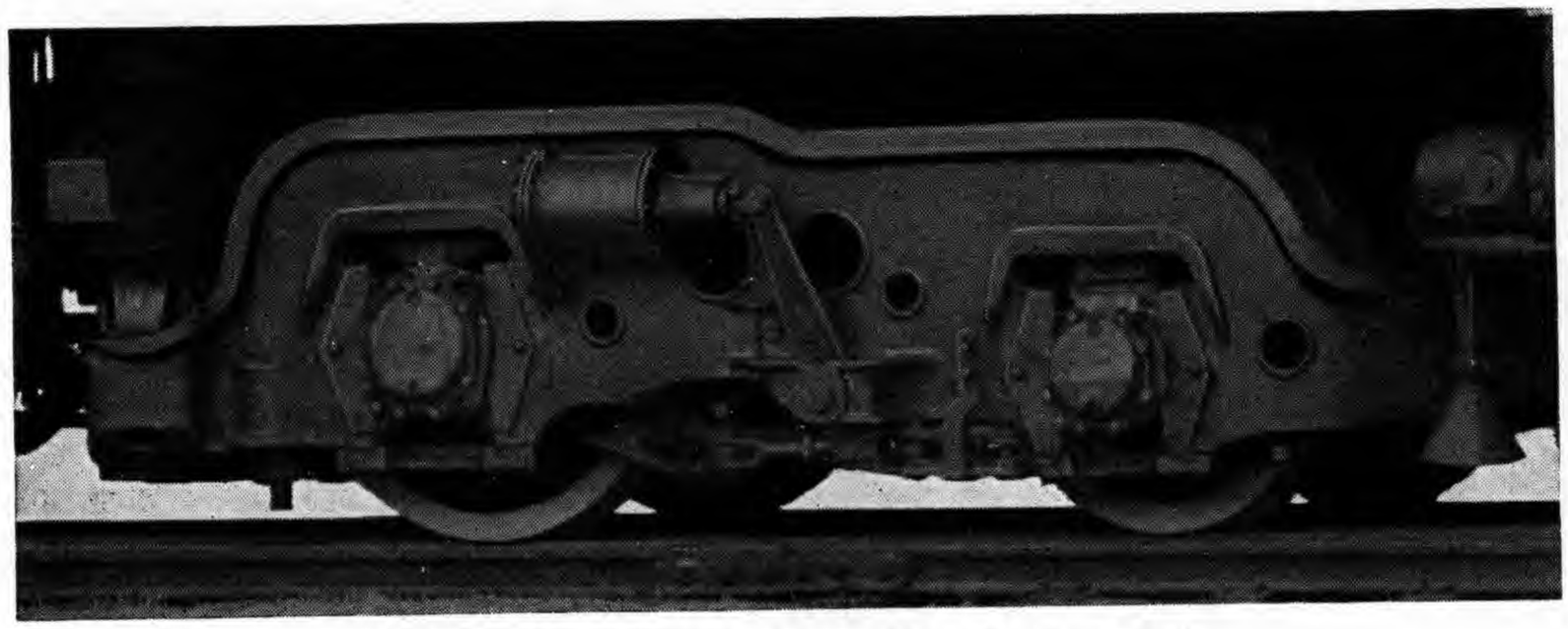
Cast Steel Delta Type Four-Wheel Trailer Truck Frame as furnished for National Railway of Brazil 4-8-4 Type Locomotives.



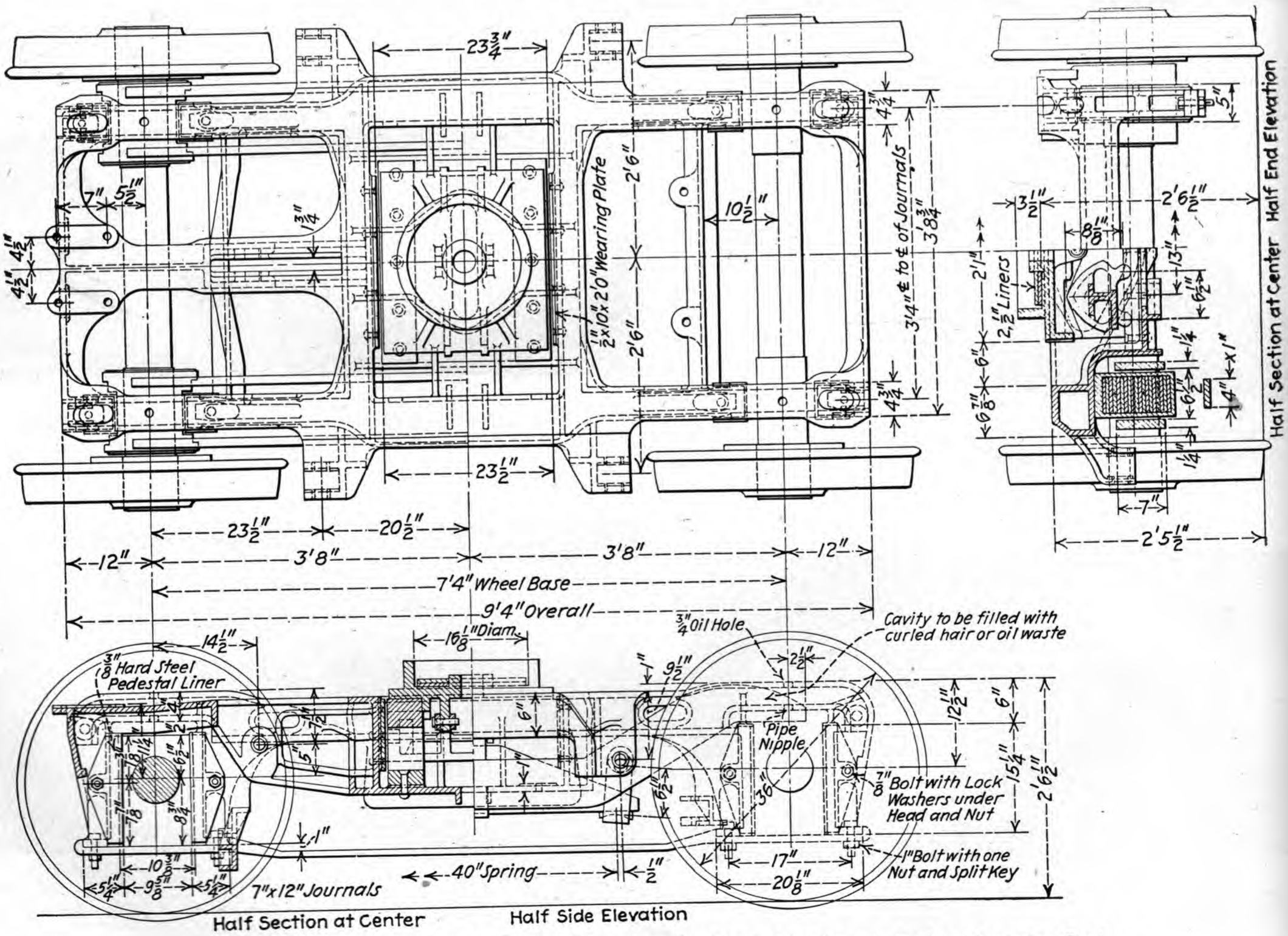
Commonwealth Delta Type Four-Wheel Trailer Truck Frames as furnished for New Zealand Government Railways 4-8-4 Type Locomotives, 3 ft. 6 in. gage.



Commonwealth Two-Wheel Delta Type Locomotive Trailing Truck showing locomotive Booster in position.

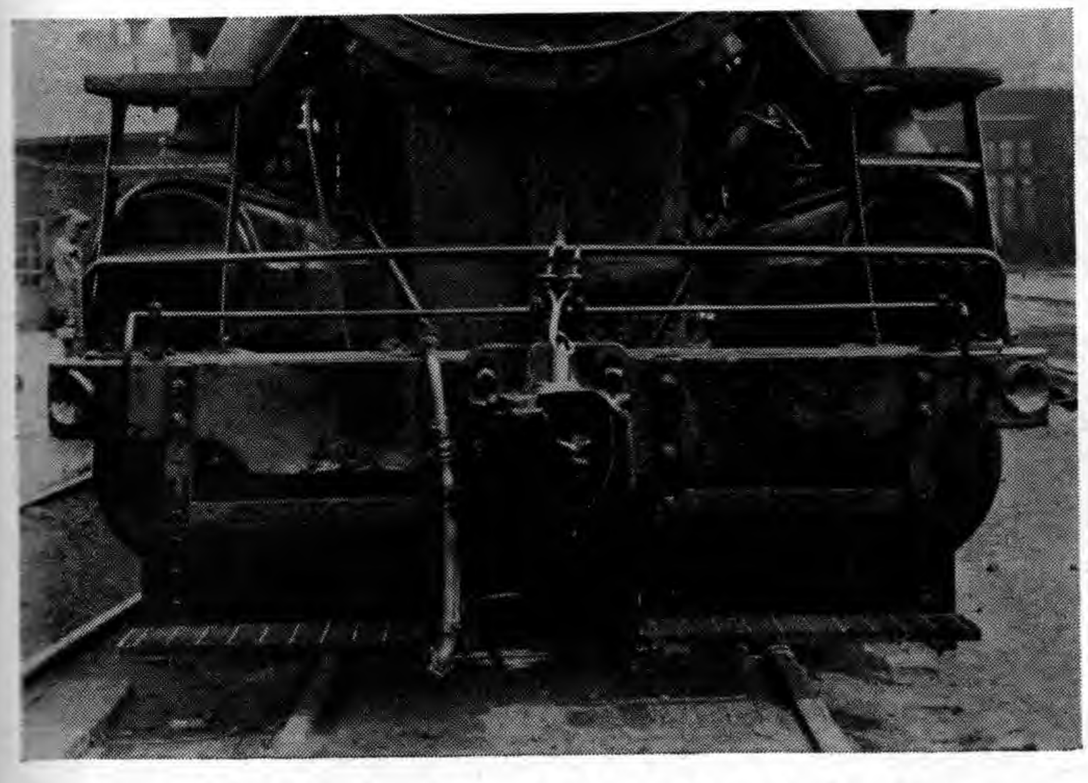


Commonwealth Four-Wheel Delta Type Trailing Truck.

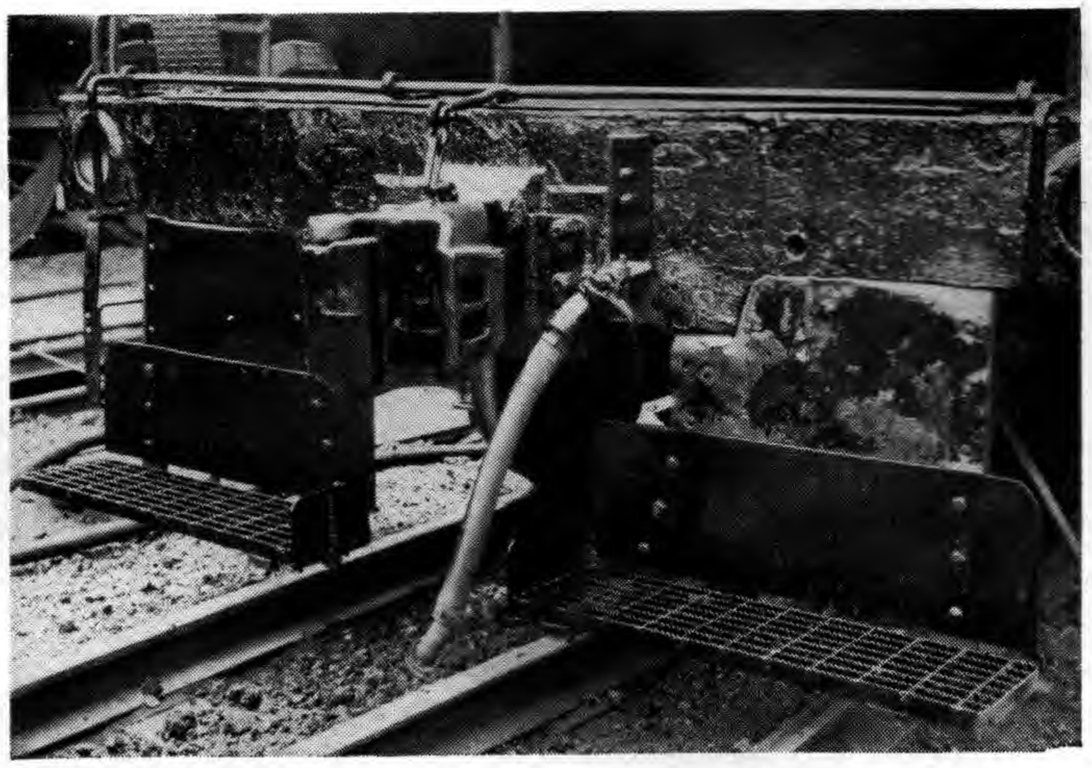


Commonwealth Four-Wheel Leading Engine Truck with Constant-Resistance Rocker Centering Device.

General Steel Castings Corporation

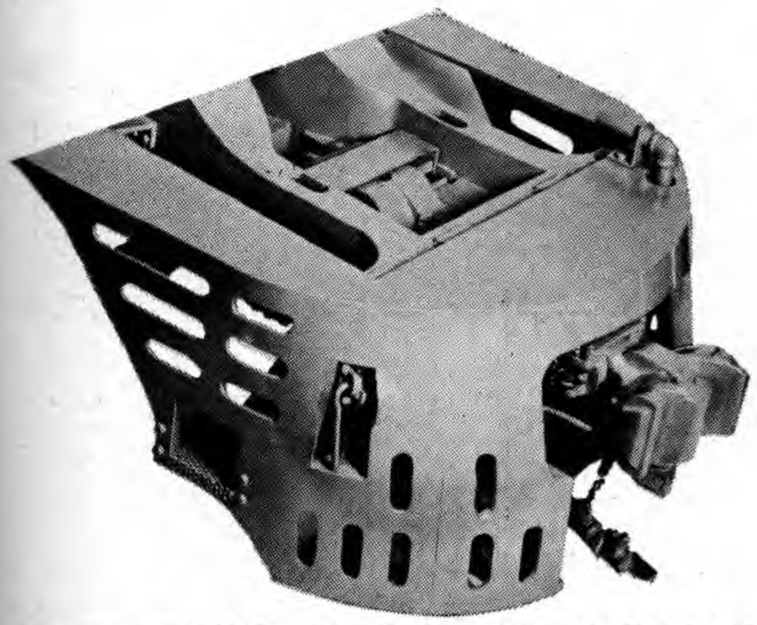


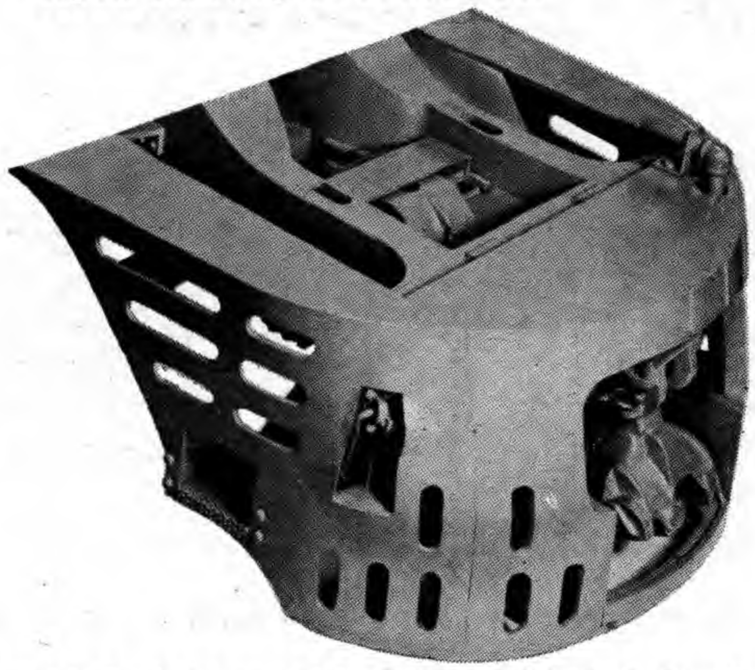
Apex Safety Footboards on the front of a switch engine.



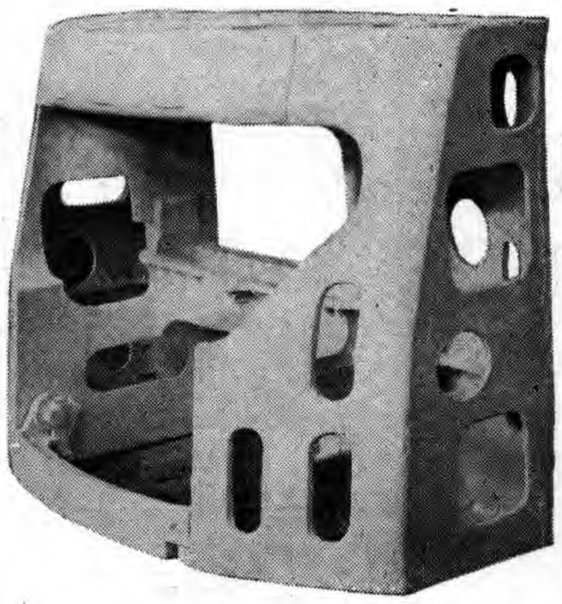
Apex Safety Footboards on the rear of a tender.

Apex Railway Products Co.



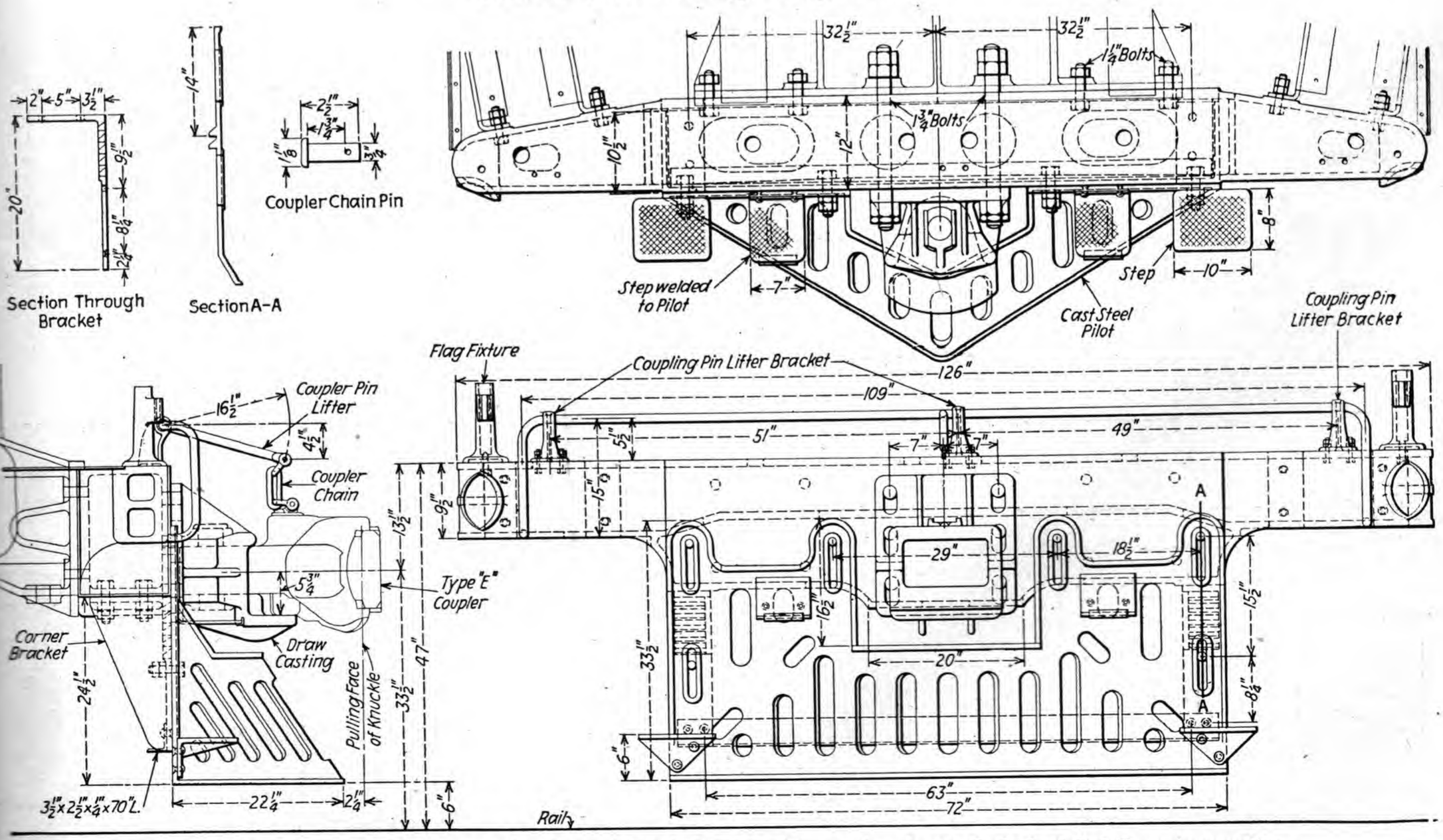


Commonwealth Cast Steel, One-Piece Deflecting Pilot with Draft Gear and Drop Type Tightlock Coupler for Diesel-Electric locomotives. (Left) Coupler and Steam Connection in operating position. (Right) Non-operating position.



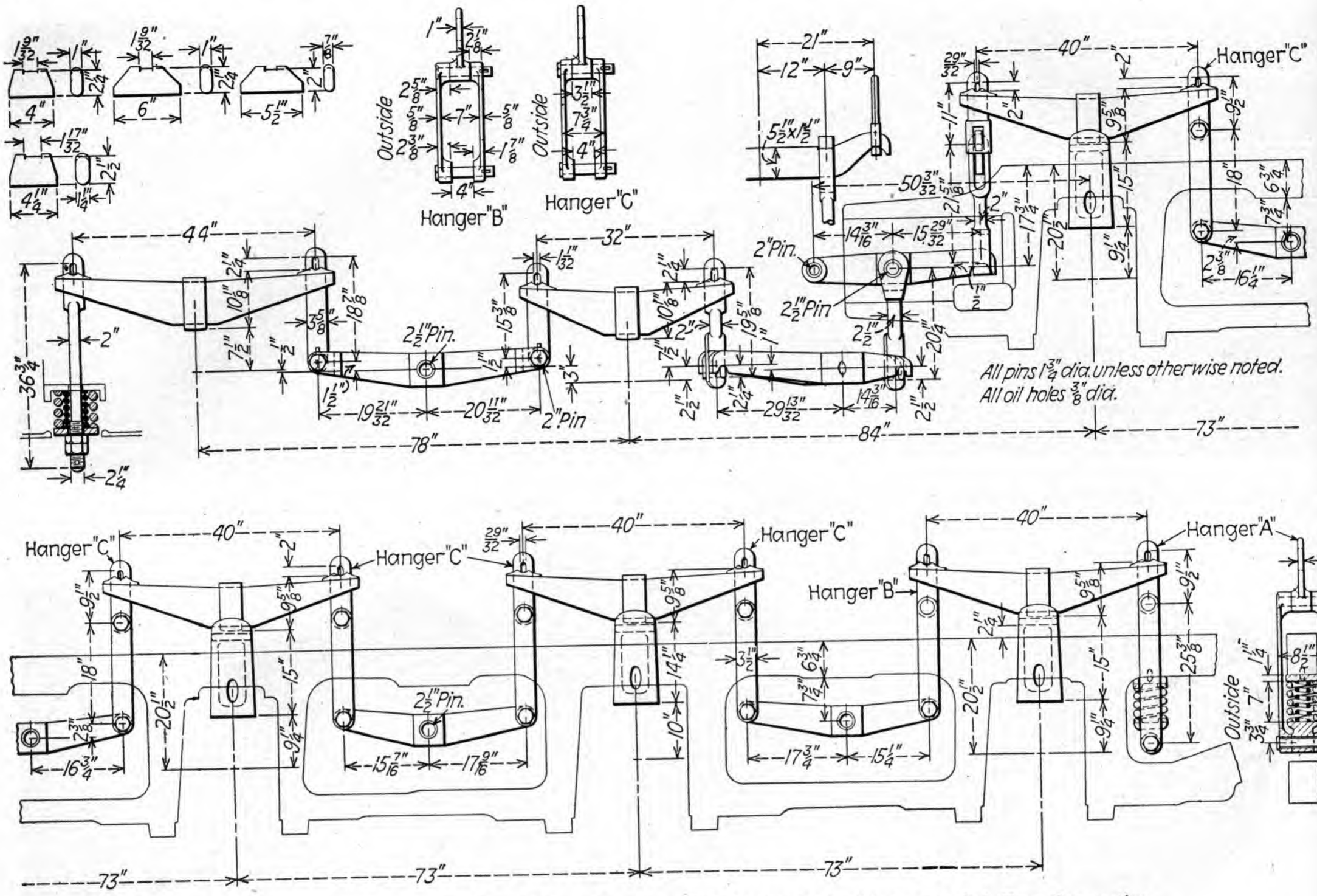
Commonwealth Pilot for Diesel-Electric locomotives — Retractable Coupler.

General Steel Castings Corporation

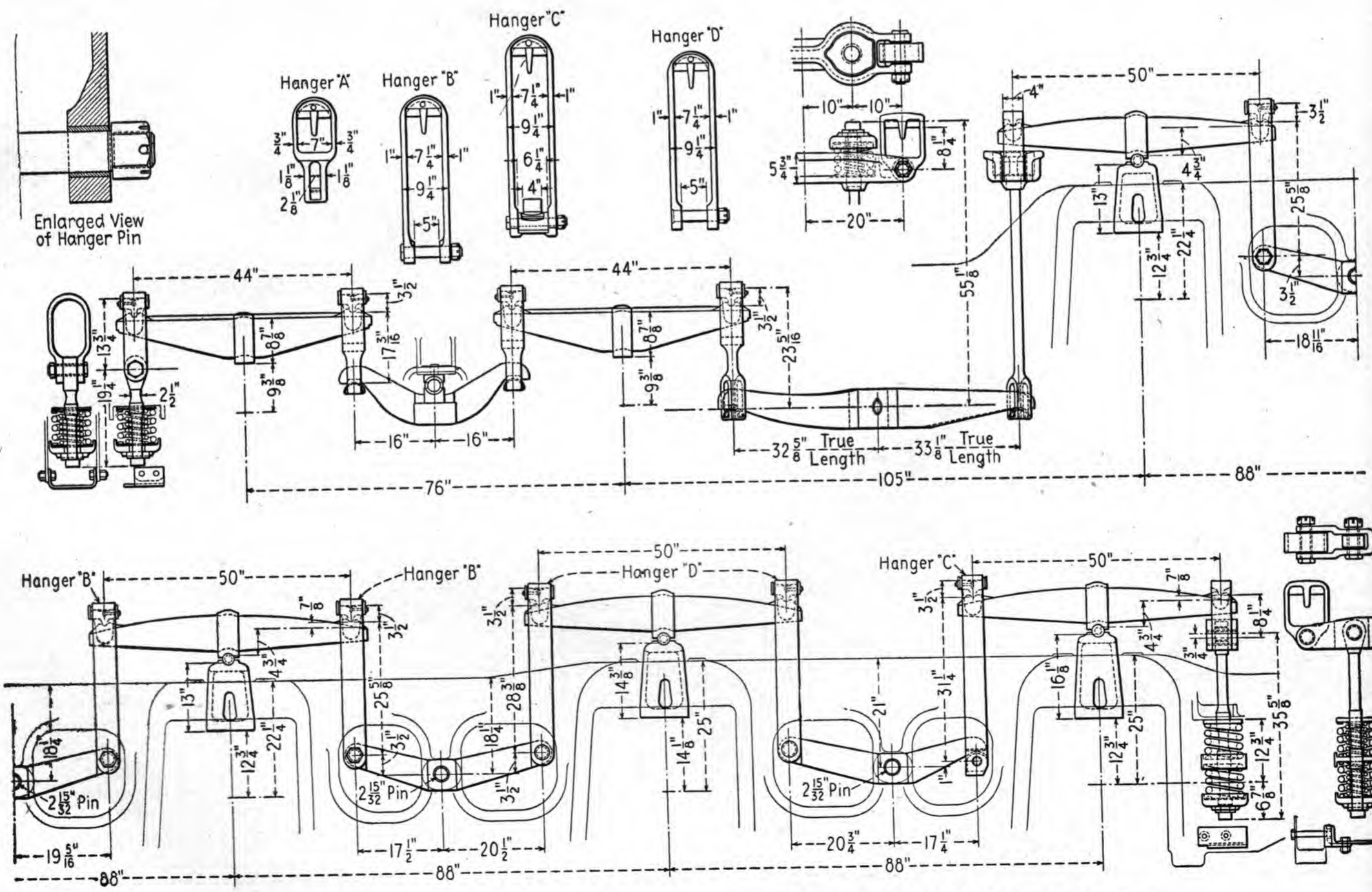


Cast Steel Pilot and Pilot Beam made by General Steel Castings Corporation for R. F. & P. 4-8-4 Type Locomotive.

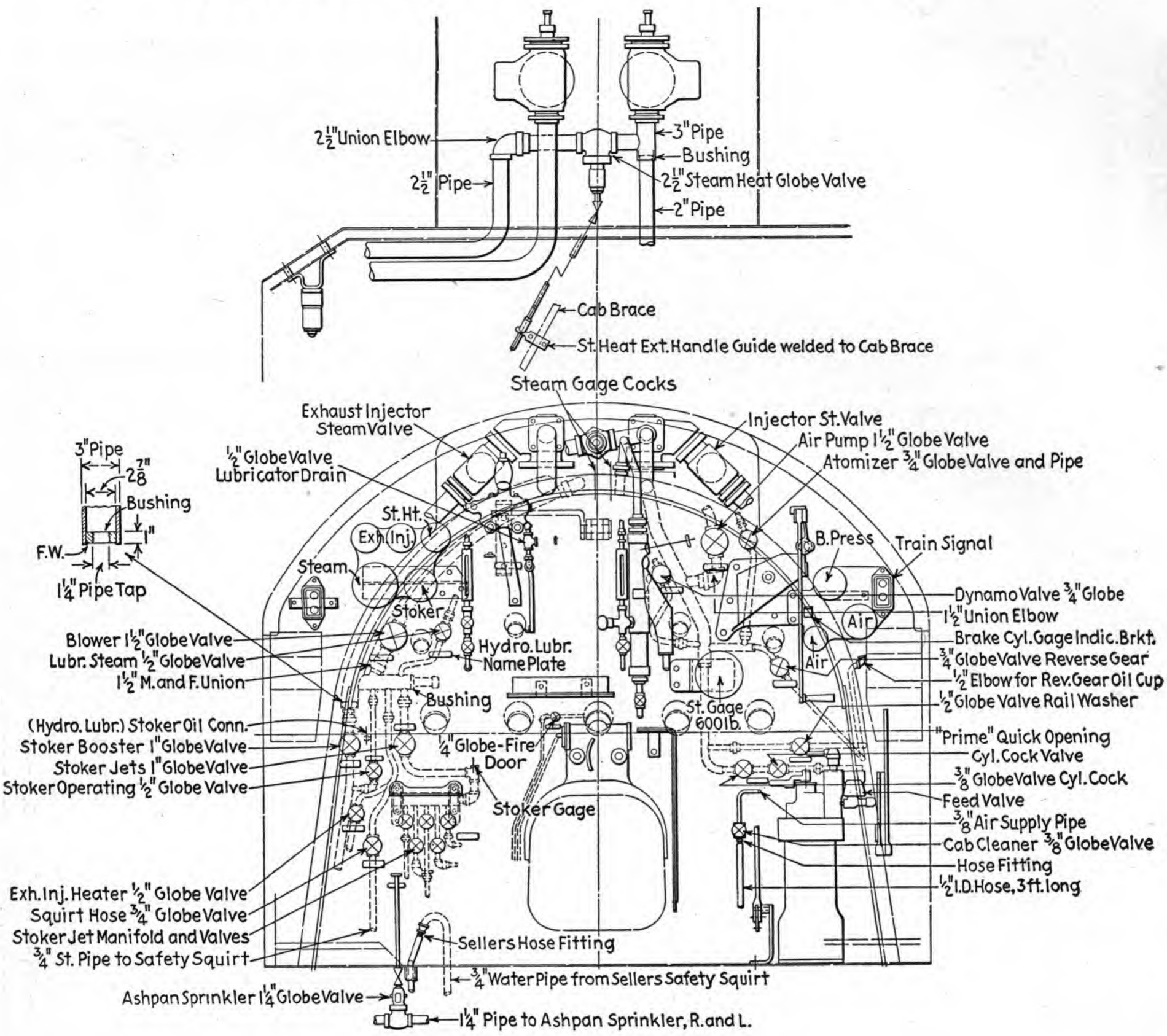
Note: Some changes have been made in last lot of Pilots.

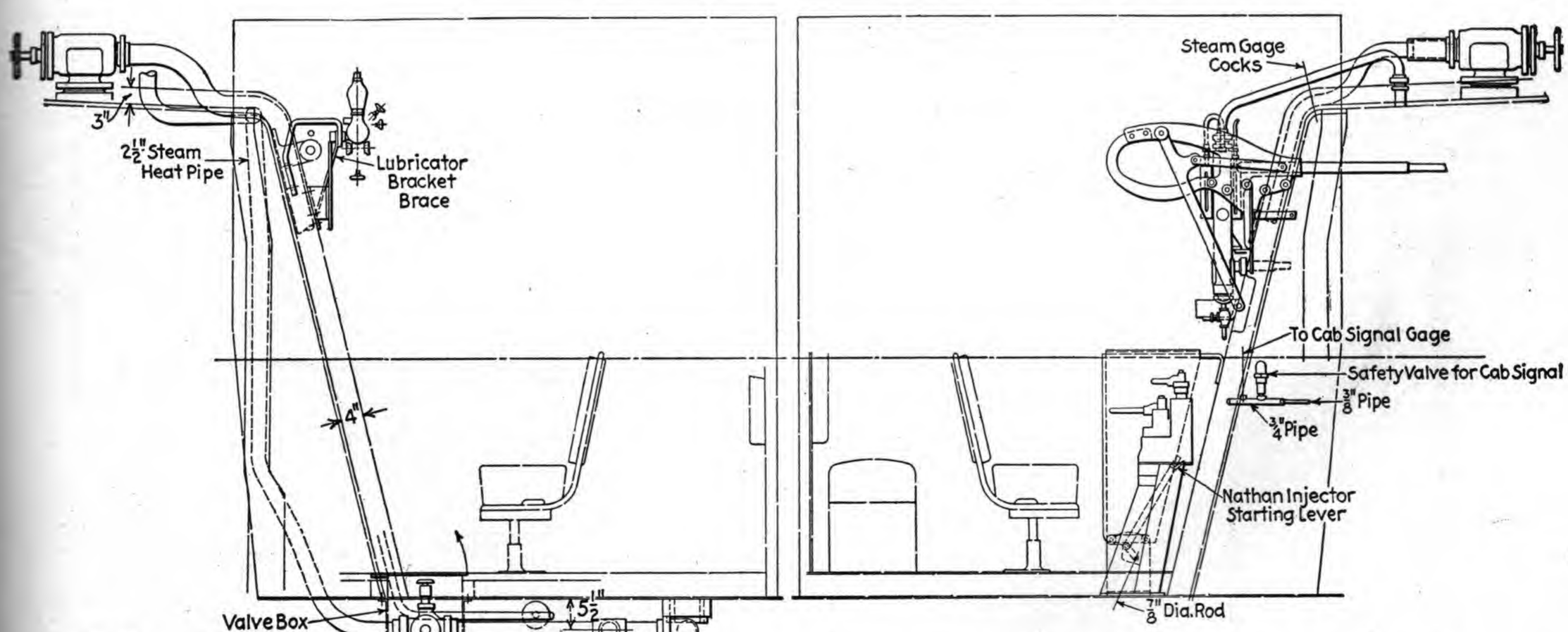


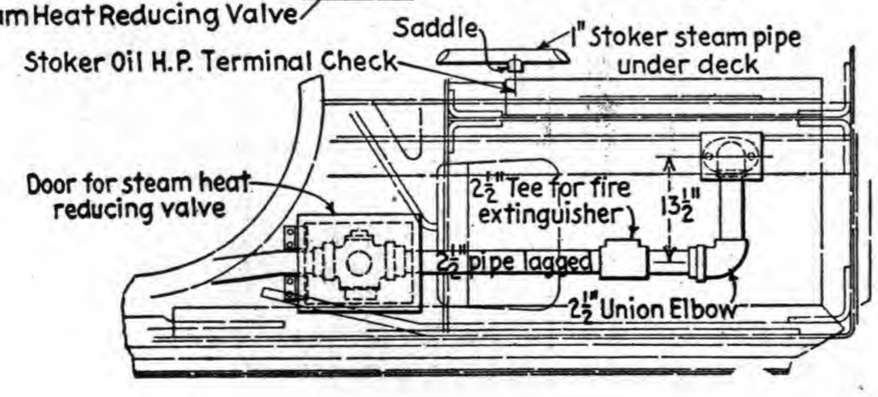
Spring rigging arrangement—Sword Type hangers. Toledo, Peoria & Western 4-8-4 Type locomotive.



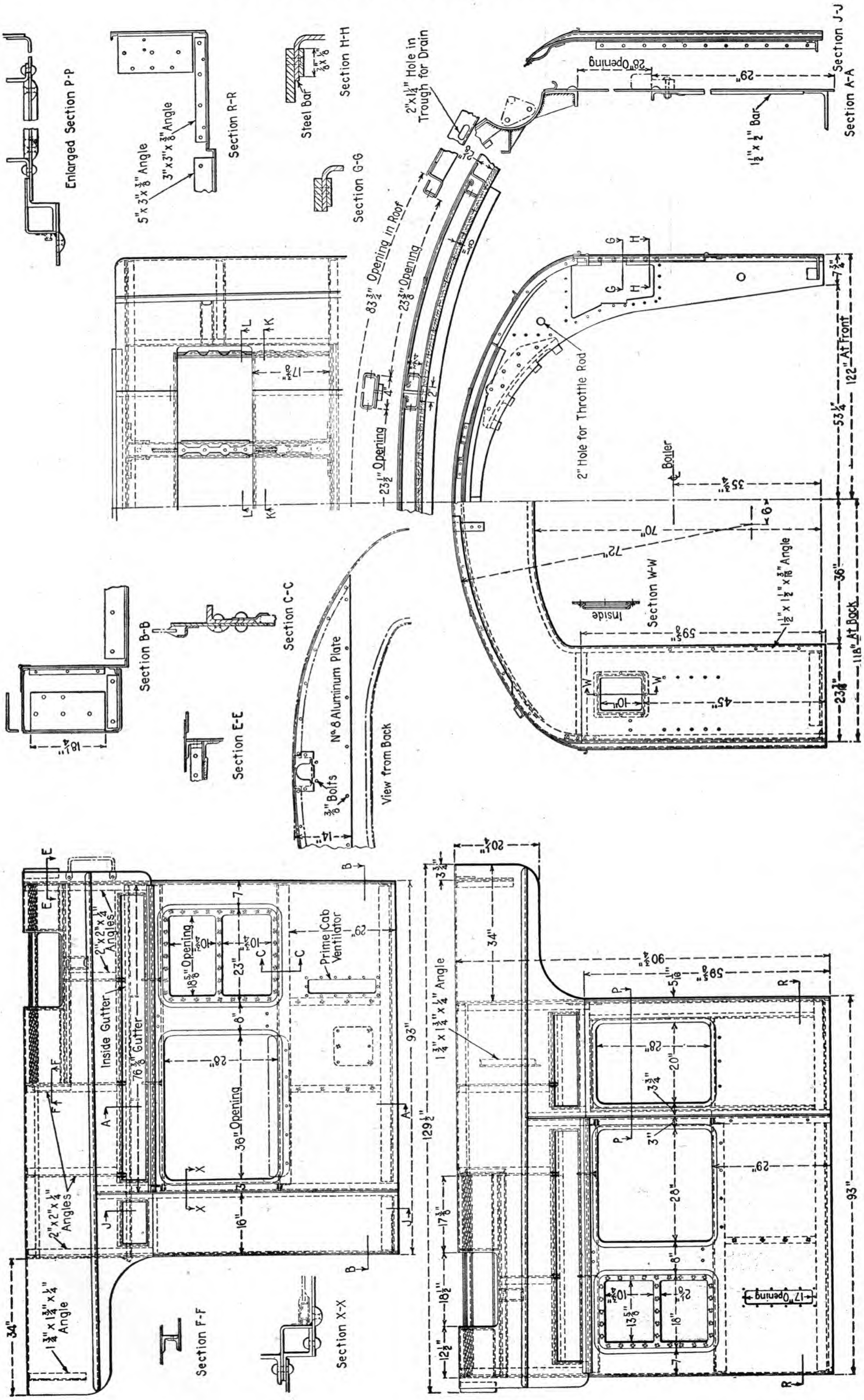
Spring rigging arrangement—Loop Type hangers. Union Pacific 4-8-4 Type locomotive.



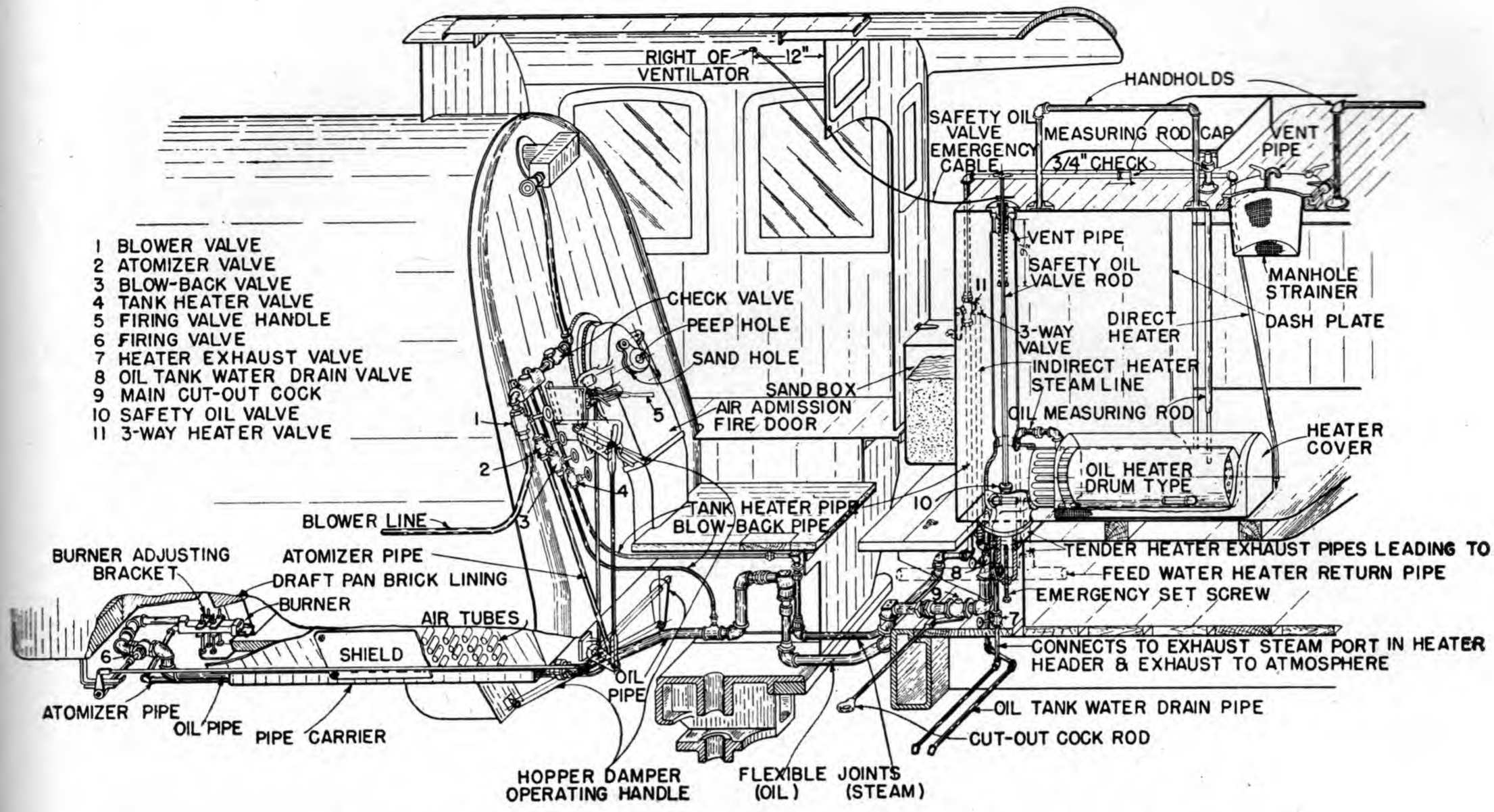




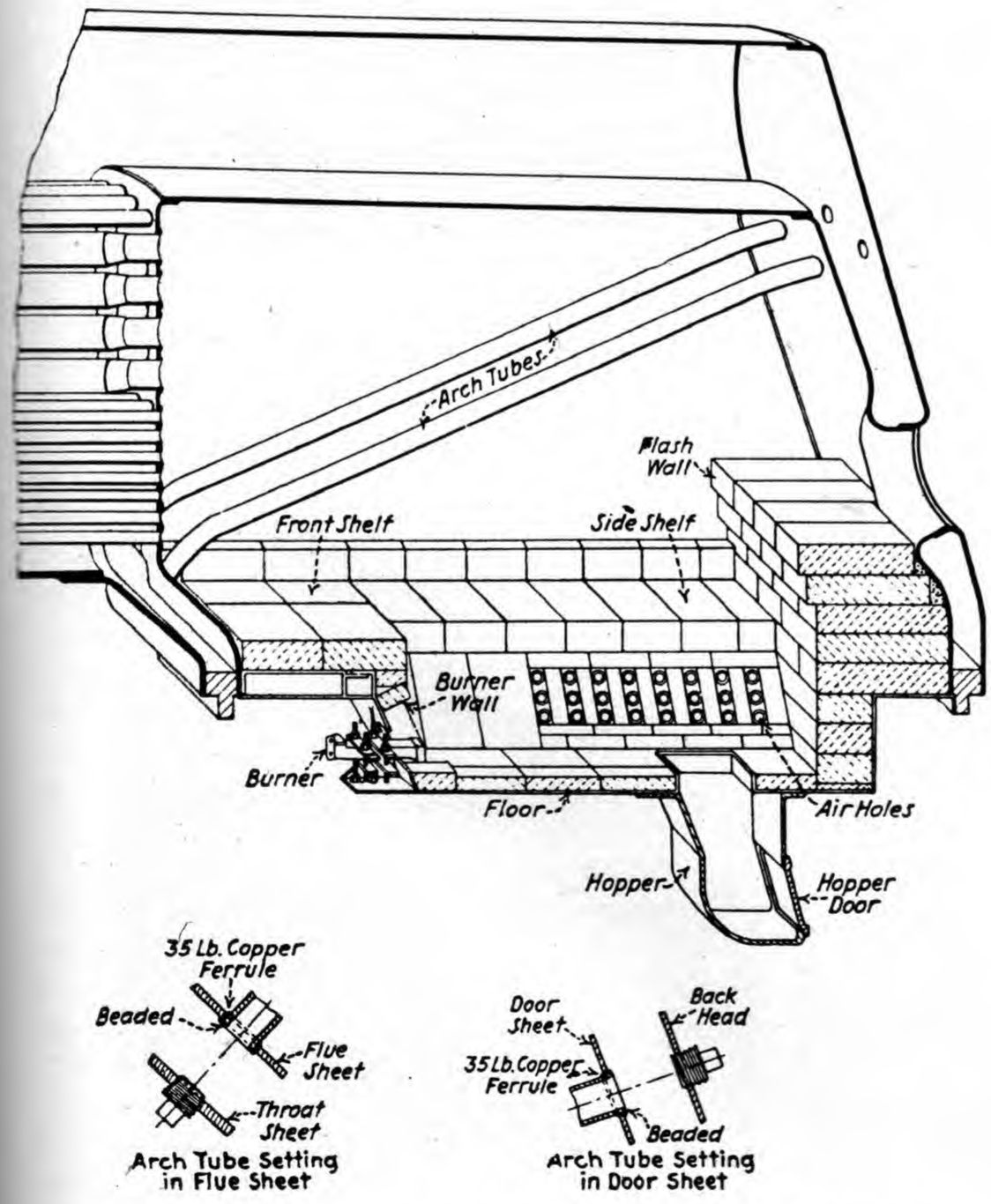
Arrangement of cab and fittings of Union Pacific 4-8-4 Type Locomotive.



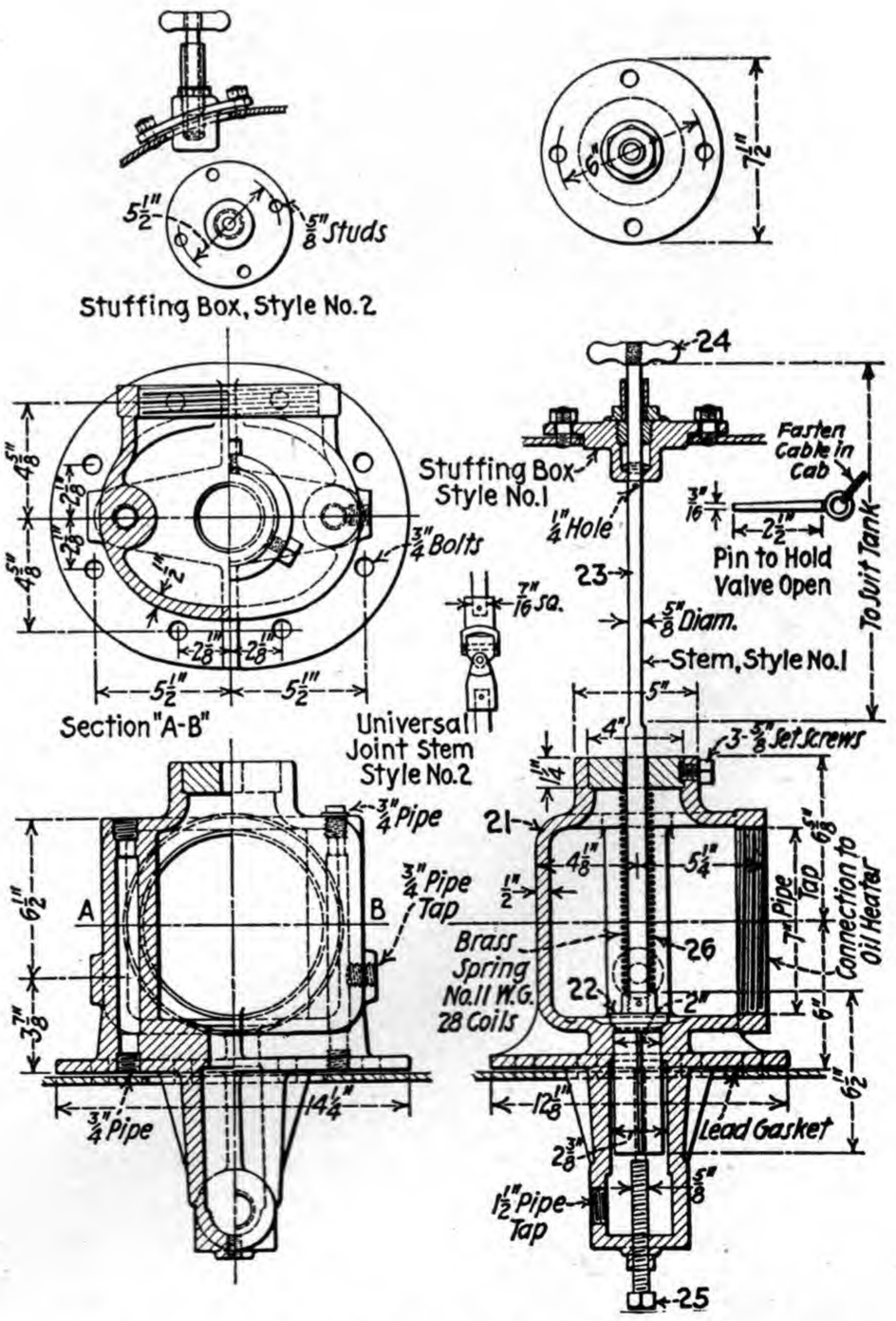
Aluminum Cab for New York Central 4-8-4 Type Locomotives, Classes S-1a, S-1b and S-2a.



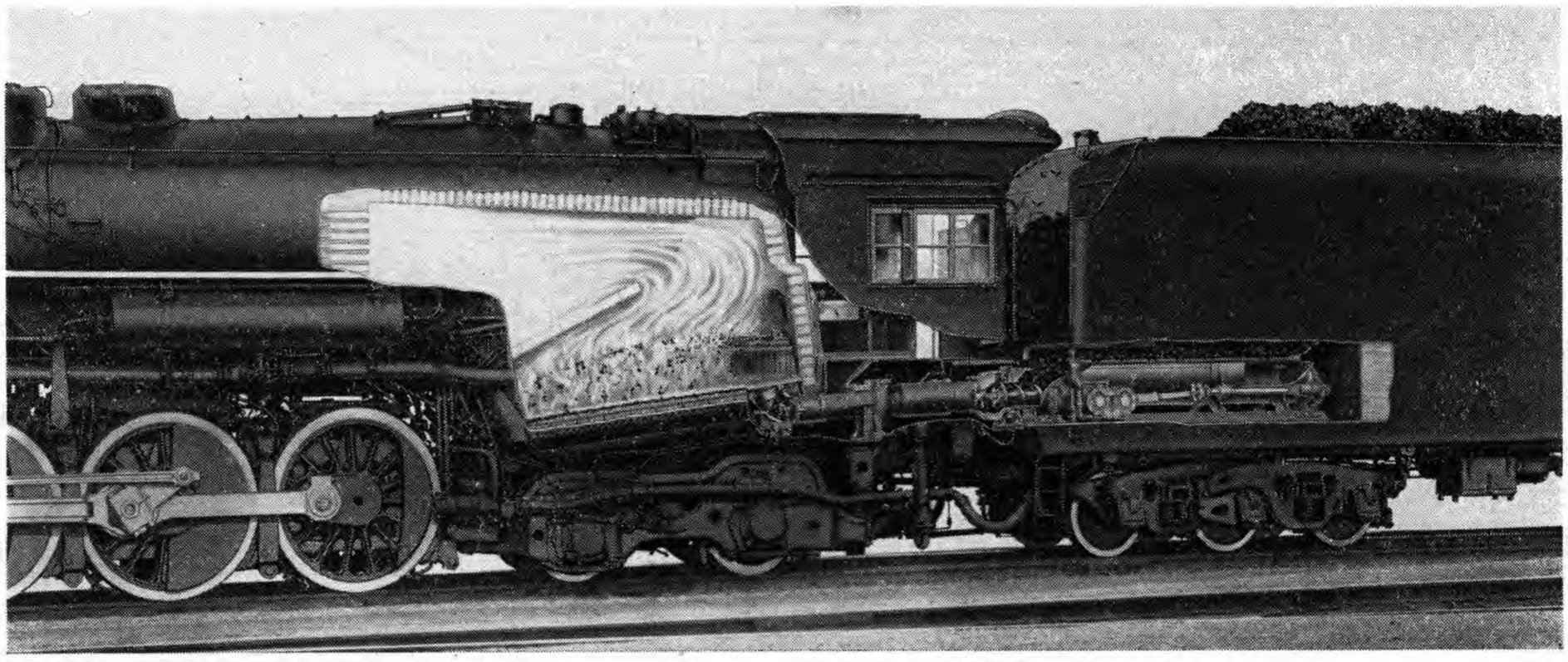
General Arrangement of Oil Burning Equipment. Atchison, Topeka & Santa Fe.



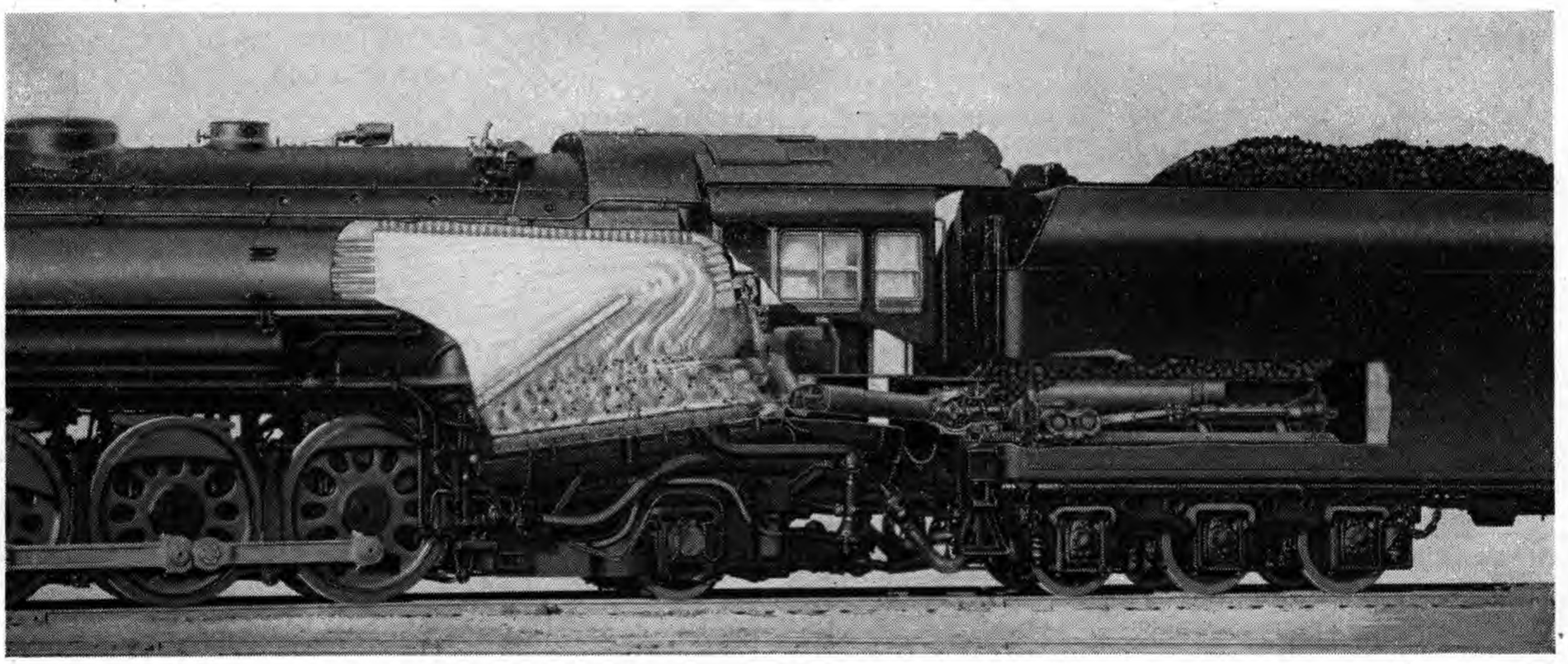
Brick Lining for Draft Pans. Atchison, Topeka & Santa Fe.
Vertical Draft System
Note: Arch Tubes are not now used.



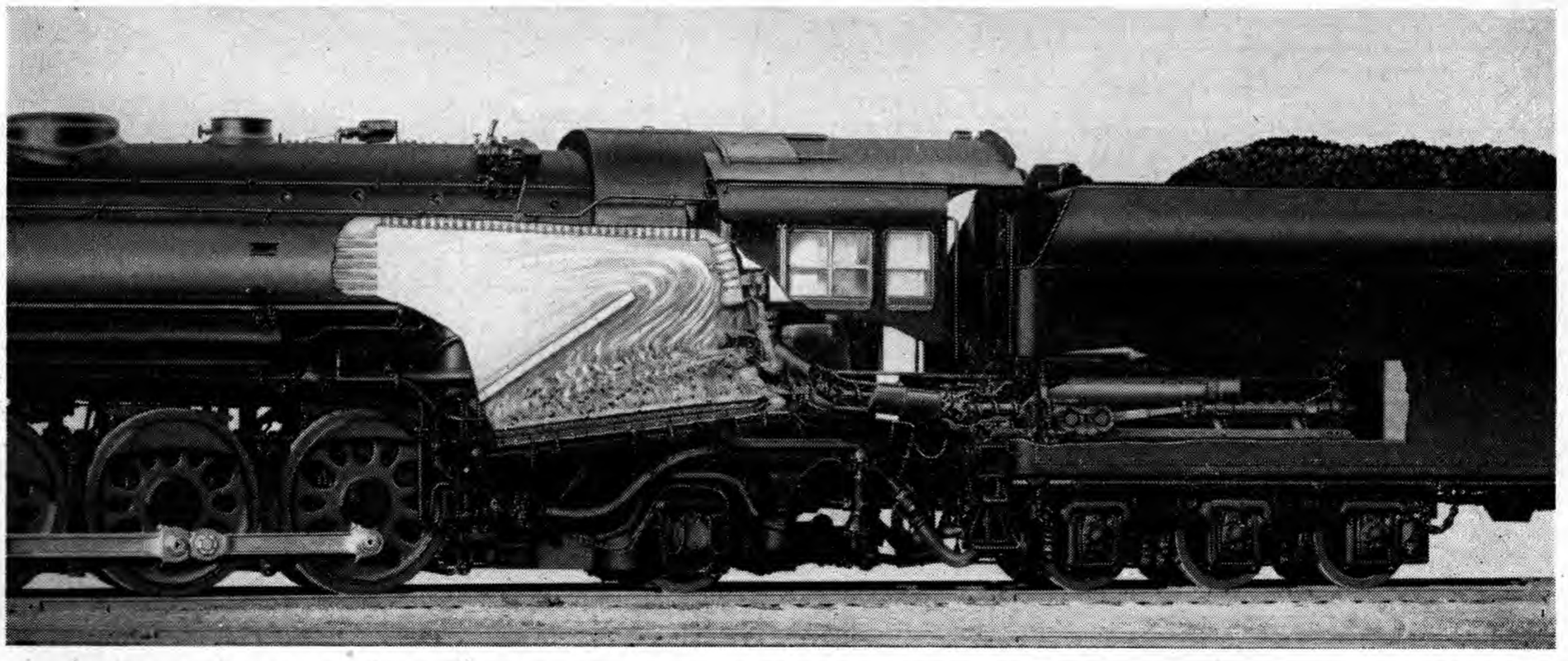
Combined Oil Tank Valve and Heater Head. Atchison, Topeka & Santa Fe.
Note: Vent Pipe has been added and spring moved to top.



Locomotive equipped with Standard MB Stoker illustrating method of moving coal from Locomotive Tender to the point of distribution inside the firebox.



Locomotive equipped with Standard BK Stoker illustrating method of moving coal from Locomotive Tender to the point of distribution in the lower part of the firedoor opening.



Locomotive equipped with Standard HT Stoker illustrating method of moving coal from Locomotive Tender to the point of distribution in the lower part of the firedoor opening.

The Standard Stoker Company, Inc.

Diesel-Electric Locomotives

The Diesel-Electric Locomotive has become the dominant type of motive power in a relatively short span of years and today there are over 11,000 locomotive units of this type in service. Diesel-Electric locomotives have undergone many changes since the first ones were put into service in 1925. These first units were 300-hp. Diesel-Electric switchers with two engines in a box car type cab.

As the horsepower to weight ratios increased the body and cab designs were also improved and by 1930 the engineman's cab had been established at one end of the locomotive instead of one at each end and the engine room hood had been narrowed for better visibility. One engine was required for 600 hp. and traction motor ratings had improved.

The next step was to drop the engines down into the frame rather than having them perched on top. This enabled the engine room hood to be dropped to give all-around visibility for the operator. Engine ratings were improved by redesign, supercharging, blowers, improved fuel handling methods, better rings and many other refinements until 1,000-hp. switchers were commonplace with a weight of only 115 to 125 tons.

The multiple-unit control system was tried and proved successful in Diesel-electric operation. By 1940 the first of the modern multiple-unit road freight locomotives appeared with immediate acceptancy by the railroads, particularly the ones who had found the single-unit streamliners a satisfactory passenger road locomotive. This multiple-unit road freight locomotive was followed shortly by a multiple-unit combination freight and passenger locomotive—the improvements in traction motor ratings permitting a gear ratio suitable for both classes of service in one locomotive.

In addition to developments in the outside appearance of the locomotive the Diesel engines were improved in general design, horsepower, stamina, and construction details. By development and improvement in the windings and insulation and by increasing the rotative speed the traction generators were able to develop from 1,250 to 2,000 hp. in machinery little larger than the older generators which produced only 600 hp.

In 1941 the combination road-switcher made its appearance on several railroads and quickly demonstrated its usefulness in local freight and once daily passenger operations where, after duty on a light passenger run, it could be turned and used for local freight. This was a boon to many short lines with unusual passenger service peaks and it was unfortunate that the war prevented exporing the possibilities of this type of locomotive until 1946.

Switch yard service has been radically changed in its nature due to the Diesel-electric's ability to work around the clock for several days at a stretch without refueling or other service. Assignments to yards away from hostling stations or enginehouses can be made without bringing the locomotive in more than twice a week in most cases. Rapid acceleration and extremely high starting tractive efforts have reduced the number of motive power units necessary for most large yard operations and the general acceptance of the Diesel-electric switcher on Class 1 railroads has made the steam switcher practically obsolete.

Road Locomotives

Many experimental units for road service have been built since the first production models of switcher locomotives established themselves. A number of packaged units with a power car were built and operated successfully during this period of development. The possibilities were demonstrated by the use of heavy switchers in multiple-unit for transfer and belt service on several railroads.

In 1940 the Electro-Motive Division of The General Motors Corporation produced a 5,400-hp. freight Diesel-electric locomotive of four units, each with a 1,350-hp. Diesel engine. It was followed almost immediately by several 4,000-hp. all-purpose Diesel-electric road locomotives composed of two units, each containing two 1,000-hp. Diesel engines.

Since 1946 the development of this type of locomotive has been rapid and has met with wide favor on railroads all over the country to such an extent that some roads have become 100 per cent Dieselized.

Road freight locomotives are generally built with four-wheel trucks having all of the weight of the locomotive on the drivers to give the high starting and continuous tractive efforts necessary for heavy freight work. The gearing is such that these locomotives may often be operated at 75 and 80 m.p.h. without damage to the traction motors, enabling them to be used in passenger service in an emergency or, as is the case on some roads, in combination freight and heavy passenger service.

Road passenger locomotives are usually built with six-wheel trucks having two driving axles and one idler axle. These locomotives have a higher horsepower rating than the freight locomotive and therefore greater weight. The idler axle helps to carry this weight without causing the axle load to become excessive and though this arrangement will not tend to increase the drawbar pull, the additional horsepower is useful to produce higher speeds and rapid acceleration at high speeds.

A new type locomotive, just introduced, uses a four-wheel truck on the front and a six-wheel truck on the rear with the weights of fuel, oil and water, which will be reduced in service, so distributed that the weight on the axles will be equalized whether the locomotive is at the beginning or end of the run.

The outer appearance seems to be established with the enginemen's cab in front with a short nose section to protect the crew in the event of accident. An anticlimb feature is an integral part of the nose section to prevent heavy objects, when struck on the road, from being thrown into the operator's cab, or from rolling under the locomotive to cause a derailment. The enclosed, heated cab with window wipers and side windows that raise and lower has further improved the comfort and efficiency of the crew members.

Switching Locomotives

A wide variety of Diesel-electric switching locomotives are available from 20-ton, 150-hp. industrial locomotives to 2,400-hp. transfer units weighing 180 tons. These various sizes are of all types, some with one and some with two engines and generators; some are equipped for multiple-unit operation in any desired combination. A new type switcher, known as the road or combination switcher, has been developed. It may be equipped with steam generators thus making it suitable for both switching and passenger service.

The smaller Diesel-electric switchers were originally built for service in steel mills where the tonnage was light, the curves sharp, and the clearances much less than those on a railroad. This type of locomotive was soon found to be practical and economical for light

plant shifting that would not justify the investment necessary for standard railroad sizes. As a result the popular 44-ton to 50-ton types were developed with horsepower ratings from 300 to 410 horsepower. The 44-ton size has met with general favor on the railroads for light road freight pickups and duty in remote yards and terminals where the service is the intermittent and standby time is an important factor.

Larger sizes range upwards to the 70- to 100-ton 600-hp. and the 115- to 125-ton 1,000 hp. switchers with single engines. The 1,200, 1,500 and 2,400 hp. units with weights of from 115 tons to 180 tons are used in heavy transfer, hump, classification yards and terminal service where the higher horsepower ratings are of value to start and keep moving large tonnages. Most of these heavier switchers may be equipped with multiple-unit control for heavy transfer or short haul tonnage moves. This is the type of Diesel-electric locomotive that has rapidly replaced steam locomotives used in the same service. Their availability is usually about 95 per cent and their utilization in busy yards and terminals nearly as high. They may be operated without servicing for several days at a time and the service facilities necessary are inexpensive to install and operate. When the locomotive is not being used it may be shut down with a resultant savings in fuel and may be left without attention until it is to be used again. This eliminates the need of a hostler and thereby makes them economical for outlying yards where service of eight hours is sufficient and the locomotives may be left until the next day without returning to the home shops.

The heavier switchers have two four-wheel trucks with a motor on each axle and the total locomotive weight on the driving axles for high starting effort. Where axle load is an important consideration, they may be provided with six-wheel trucks, with four driving axles. A few have been built with six motors where motor capacity was of extreme importance.

The lighter switchers come with many types of wheel arrangements to suit the size and service, from two axle locomotives with one motor to drive both axles through a chain or rod connection to two four-wheel trucks, some with two motors and some with four, dependent upon the use. The two-motor locomotives are generally built with a rod connection between the wheels on each truck so that all axles may be driven. The smaller locomotives with two engines and two generators synchronized may be operated by one engine in the event of one engine failure to bring them to the maintenance shop.

Many of the lighter switchers may be adapted to rail gauges less than standard without scacrificing horsepower or tractive effort. This feature is important for many mill and industrial plant operations. The two-engine light switchers are generally built with a steeple cab with exceptional visibility all around, another desirable feature for plant and mill operation.

The Diesel-electric switcher has accounted for a large majority of the locomotive replacements and Diesel-electric locomotive production for many years, although during the past five years the production of road units has increased rapidly. Many switching and terminal companies and Class 2 and 3 railroads have become 100 per cent Dieselized with the switcher type locomotives. The first rilroad of any size to become entirely Dieselized was in 1936 when 13 Diesel-electric locomotives replaced 19 steam locomotives of various sizes in a belt and transfer line service.

Since the advent and development of the road or combination switcher type locomotives many other short lines have followed in Dieselizing as an economical method of operating profitably where the total volume of passenger and freight traffic is relatively low. Many railroads are Dieselizing their commuter service where the passenger traffic reaches peaks twice a day and the combination Diesel-electric switcher may be used for local freight during the inactive portions of the passenger service day. Most of these combination units are geared to 65 m.p.h. but may be obtained with up to 90 m.p.h. gearing.

Many years ago the General Electric Company on one of its test units experimented with dynamic braking, similar in operation to the old regenerative braking employed on some types of electric locomotives. Although the principle was sound the space limitations did not permit enough resistors to dissipate the current generated at the wheels of the locomotive when braking. Now that development of the Diesel engine, the electrical equipment and the component parts has progressed past the experimental stage it is possible to find space on the chassis of the locomotive for the rather ponderous equipment required for successful dynamic braking. On many railroads this type of braking would not justify the additional expense of placing it on the locomotive but on railroads with a rugged profile this new braking can and does pay for itself in a very short time in the savings of man hours, train time, brake shoes and overheated wheels plus the elimination of the fire hazard due to sparking brake shoes on the locomotive. It has been found that dynamic braking horsepower is a little greater than the tractive horsepower of the locomotive, and any train that a locomotive can haul up a grade can be brought down the same grade at the same speed that it was taken up by the same locomotive without the use of the air brakes.

The operation of these new road locomotives has become nearly automatic with all of the controls of the engine and electrical equipment concentrated in the operating cab of the locomotive and various warning bells and lights located there indicate the failure of equipment in the engine room. Refueling is a matter of three or four minutes and it is possible to keep these units on the road for several days at a time without shop attention as proper inspections can be made at the terminals in a relatively short time.

A.A.R. Standard System of Nomenclature for Axle and Truck Arrangement of Locomotives Having Electric Transmission

The A.A.R. nomenclature system used for Diesel-electric locomotives was adopted in 1932 and revised in 1949. It is similar to the German or Continental system described on Page 8. The Whyte system of locomotive classification, also given on Page 8, which is commonly used for steam locomotives is frequently applied to Diesel-electric locomotives. However, this system is not as descriptive of locomotives having electric transmission as the A.A.R. Standard System because the symbols do not distinguish between motor-driven and idler axles.

A.A.R. Standard System

Manual F-103

Starting at the front end of locomotives designed for single end operation or at either end of locomotives built for double end operation, the wheels in any wheel base, the truck connections for the individual units, and the connections between such units, are designated in their consecutive order. Letters represent the driving axles.

numerals the guiding or carrying axles, and signs the absence or presence of connections between trucks.

1. The number of adjacent driving axles (a) in a rigid wheel base, or (b) on a truck, is represented by a letter selected according to its alphabetical order.

Examples: A—One driving axle.
B—Two driving axles.
C—Three driving axles.
D—Four driving axles, etc.

2. The number of adjacent idle (non-driving) axles in a rigid wheel base or a truck is represented by an Arabic numeral.

Examples: 1—One idle axle.
2—Two idle axles, etc.

3. Trucks having both driving and idle axles in the same rigid wheel base are designated by a letter and a numeral placed together in proper order.

Examples: 1A—Truck with one idle and one driving axle.
1B—Truck with one idle and two adjacent driving axles.
A1A—Truck with one idle and two non-adjacent driving axles.

Additional examples of various truck wheel arrangements are shown in diagram form on Manual page F-104A.

4. Plus (+) signs are used in indicate:
(a) Articulated joints between trucks under a single unit locomotive.
(b) Permanent connections between units of multiple unit locomotives, such as drawbars.

5. Minus (—) signs are used to indicate:
(a) Separation between swivel type trucks, not articulated.
(b) Separation between a rigid base of any group of driving wheels and adjacent guiding or carrying trucks not connected through an articulated joint.
(c) Readily separated connection, such as A.A.R. couplers, between units of multiple unit locomotives.

6. (a) When two or more similar motive power units with automatic couplers between units, each with the same or symmetrical wheel arrangement, are operated in multiple as a locomotive, the number of units is indicated by a numeral preceding the classification of one unit put in parenthesis.

(b) When two or more units with dissimilar wheel arrangements are operated in multiple, the wheel arrangement of each unit is shown in consecutive order, starting from the front of the locomotive, setting off each unit by parenthesis with plus or minus signs between the units to represent articulated or automatic couplers respectively, to indicate connections between the units.

7. Examples of designating wheel arrangements of single and multiple units with various types of trucks, and connections between trucks and units, are shown in diagram form on this page.

DESCRIPTION OF TRUCK OR LOCOMOTIVE	DIAGRAM OF AXLE AND TRUCK ARRANGEMENT	DESIGNATION
Two Wheel Truck.-(a) With driving axle	Ⓜ	A
(b) With idler axle	①	1
Four Wheel Truck.-(a) With all driving axles	Ⓜ Ⓜ	B
(b) With all idler axles	① ①	2
(c) With leading idler axle	① Ⓜ	1A
(d) With leading driver axle	Ⓜ ①	A1
Six Wheel Truck.-(a) With all driving axles	Ⓜ Ⓜ Ⓜ	C
(b).-With all idler axles	① ① ①	3
(c).-With center idler axle	Ⓜ ① Ⓜ	A1A
(d).-With leading idler axle	① Ⓜ Ⓜ	1B
Eight Wheel Truck.-(a) With all driving axles	Ⓜ Ⓜ Ⓜ Ⓜ	D
(b).-With all idler axles	① ① ① ①	4
(c).-With leading and trailing idler axles	① Ⓜ Ⓜ ①	1B1
(d).-With leading and trailing driving axles	Ⓜ ① ① Ⓜ	A2A
(e).-With leading and second idler axles	① ① Ⓜ Ⓜ	2B
(f).-With second idler axle	Ⓜ ① Ⓜ Ⓜ	A1B
Single Unit Locomotive.-(a) With two swivel 4 wheel trucks.-all driving axles	⟨Ⓜ Ⓜ-Ⓜ Ⓜ⟩	B-B
(b).-With two swivel 6 wheel trucks-center idler axle	⟨Ⓜ ① Ⓜ-Ⓜ ① Ⓜ⟩	A1A-A1A
(c).-With 4 wheel guiding truck and two 4 wheel trucks having all driving axles, with articulated connection between driving trucks.	⟨① ①-Ⓜ Ⓜ+Ⓜ Ⓜ⟩	2-B+B
(d).-With 2 wheel guiding truck and one 8 wheel truck having all driving axles	⟨①-Ⓜ Ⓜ Ⓜ Ⓜ⟩	1-D
(e).-With 4 wheel guiding truck at each end of locomotive, and two 8 wheel trucks, having all driving axles and with articulated connection between driving trucks.	⟨① ①-Ⓜ Ⓜ Ⓜ Ⓜ+Ⓜ Ⓜ Ⓜ Ⓜ-① ①⟩	2-D+D-2
Multiple Unit Locomotive.-(a) Three units, each with two 4 wheel swivel trucks having all driving axles, units connected by automatic coupler.	⟨Ⓜ Ⓜ-Ⓜ Ⓜ - Ⓜ Ⓜ-Ⓜ Ⓜ - Ⓜ Ⓜ-Ⓜ Ⓜ⟩	3(B-B)
(b).-Two units, each with two 6 wheel swivel trucks having center axle idler, and units connected by automatic coupler.	⟨Ⓜ ① Ⓜ-Ⓜ ① Ⓜ - Ⓜ ① Ⓜ-Ⓜ ① Ⓜ⟩	2(A1A-A1A)
(c).-Two units, each with two 4 wheel swivel trucks, all driving axles with articulated connection between units.	⟨Ⓜ Ⓜ-Ⓜ Ⓜ + Ⓜ Ⓜ-Ⓜ Ⓜ⟩	(B-B)+(B-B)
(d).-Four units, each with two 4 wheel swivel trucks, all driving axles with articulated connection between 1st and 2nd and between 3rd and 4th units and automatic couplers between 2nd and 3rd units.	⟨Ⓜ Ⓜ-Ⓜ Ⓜ + Ⓜ Ⓜ-Ⓜ Ⓜ - Ⓜ Ⓜ-Ⓜ Ⓜ + Ⓜ Ⓜ-Ⓜ Ⓜ⟩	2[(B-B)+(B-B)]
Three unit locomotive with 4 wheel guiding truck on leading and trailing units with all units having two 4 wheel driving trucks, with articulated connection between driving trucks and permanent drawbars between units.	⟨① ①-Ⓜ Ⓜ+Ⓜ Ⓜ + Ⓜ Ⓜ+Ⓜ Ⓜ + Ⓜ Ⓜ+Ⓜ Ⓜ-① ①⟩	(2-B+B1)+(B+B)+(B+B-2)

Axle and truck arrangements of locomotives having electric transmission.

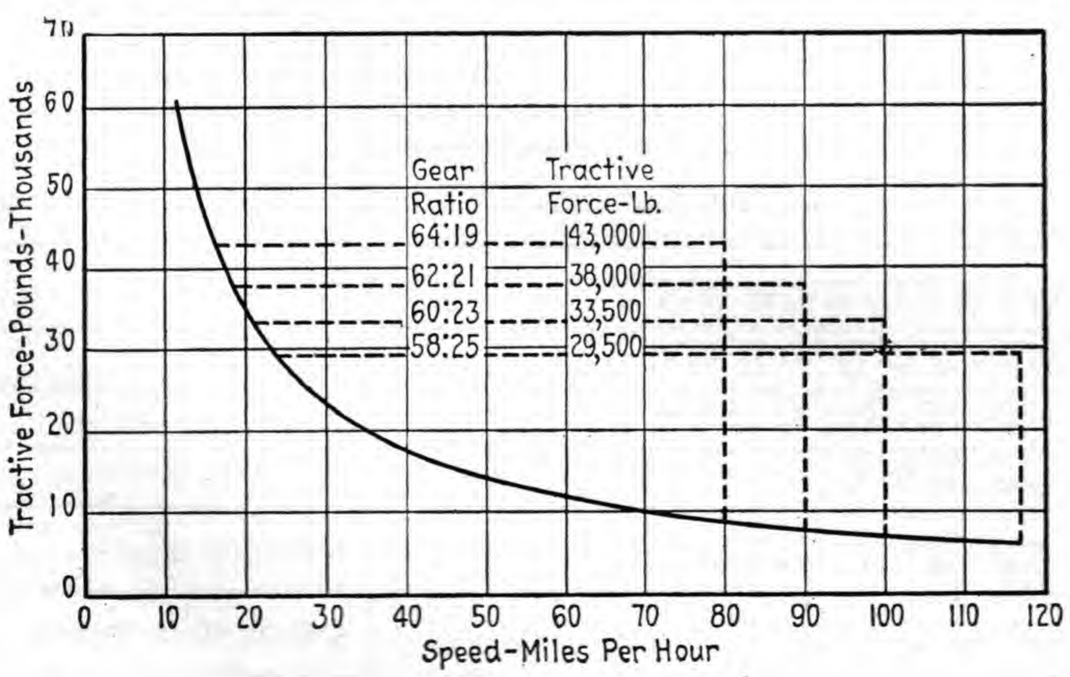
Partial List of Railroads Using Alco-G.E. 2,000-Hp. and 2,250-Hp. Passenger Locomotives

Atchison, Topeka & Santa Fe
Chicago and Northwestern
Chicago, Rock Island & Pacific
Denver & Rio Grande Western
Erie
Gulf, Mobile & Ohio
International Great Northern
Lehigh Valley
Missouri, Kansas, Texas
Missouri Pacific
New York Central
New York, Chicago & St. Louis (Nickel Plate)
New York, New Haven & Hartford
Pennsylvania
Pittsburgh & Lake Erie
Southern Pacific
Southern
St. Louis - Southwestern
Union Pacific
Wabash

Alco-G.E. 2,250-Hp. Passenger Locomotive

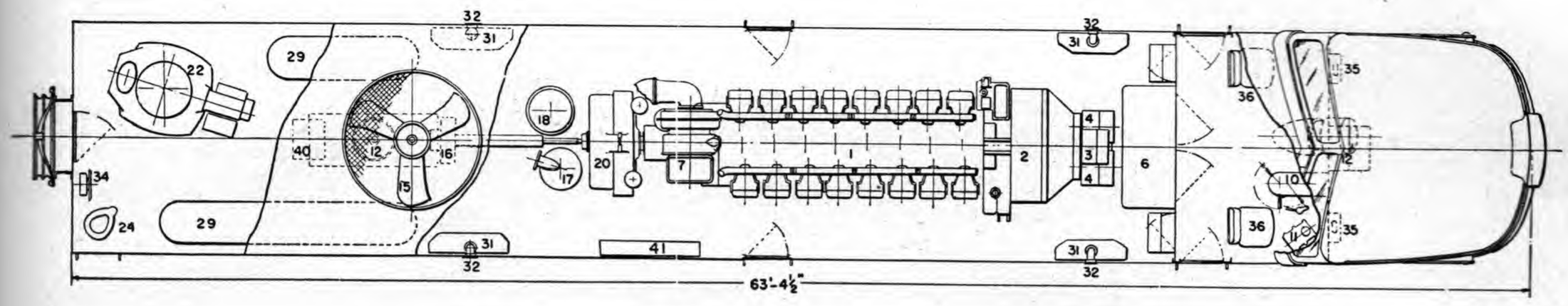
General Characteristics, Weights and Dimensions

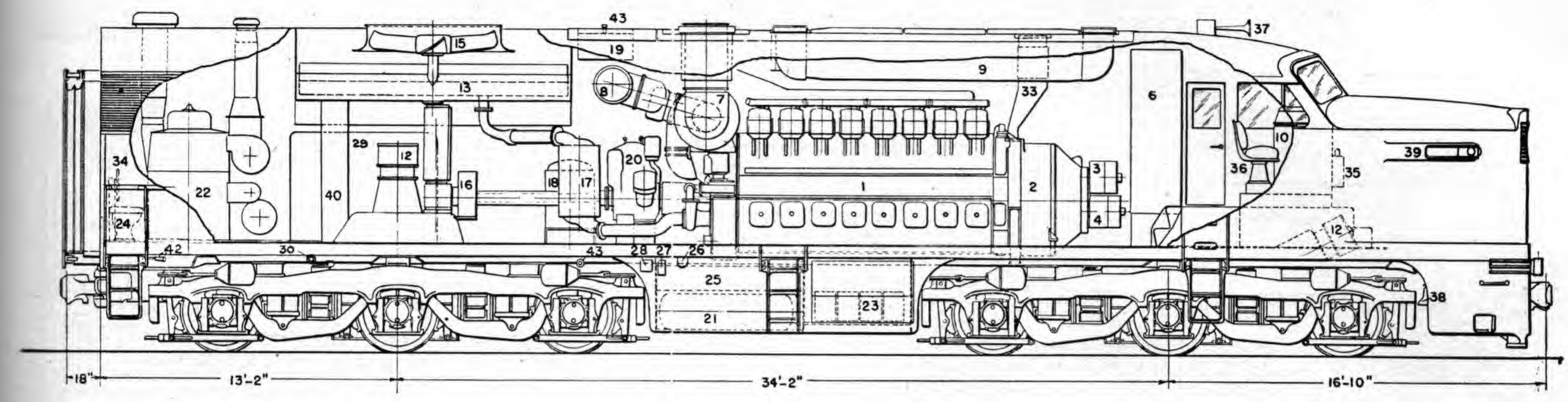
Type:		
Whyte symbol	0-6-6-0	
A.A.R. symbol	A1A-A1A	
Engines:		
Number per unit	One	
Type	16 cyl., 4 cycle, vee, turbocharged	
Cylinders, bore and stroke, in	9 by 10½	
Horsepower available for traction	2,250	
Generator:		
Make	G. E.	
Type	GT-566	
Traction motors:		
Number	4	
Make	G. E.	
Type	GE-752	
Journal bearings:		
Type	Roller	
Diameter, in	6½	
Wheels, diameter, in	40	
Wheel base, ft.-in.:		
Truck	15-6	
Locomotive	49-8	
Distance between truck centers, ft.-in.	34-2	
Maximum dimensions, over-all, ft.-in.:	A Unit	B Unit
Width	10–6½	10–6½
Height	14–11	14–8
Length over coupler pulling faces	65–8	63–6
Weights in working order, lb.:		
Locomotive, total, approx.	303,000	300,000
On drivers, approx.	202,000	200,000
Minimum radius curvature, deg.	21	
Supplies (total capacity):		
Lubricating oil, gal.	230	
Fuel oil, gal.	1,200	
Engine cooling water, gal.	300	
Train heating water, gal.	1,000	
Sand; cu. ft.	22	
Air brake schedule	24-RL	
Gear ratio	See curve	
Continuous rating, tractive force, lb.	See curve	
Maximum speed, m.p.h.	See curve	

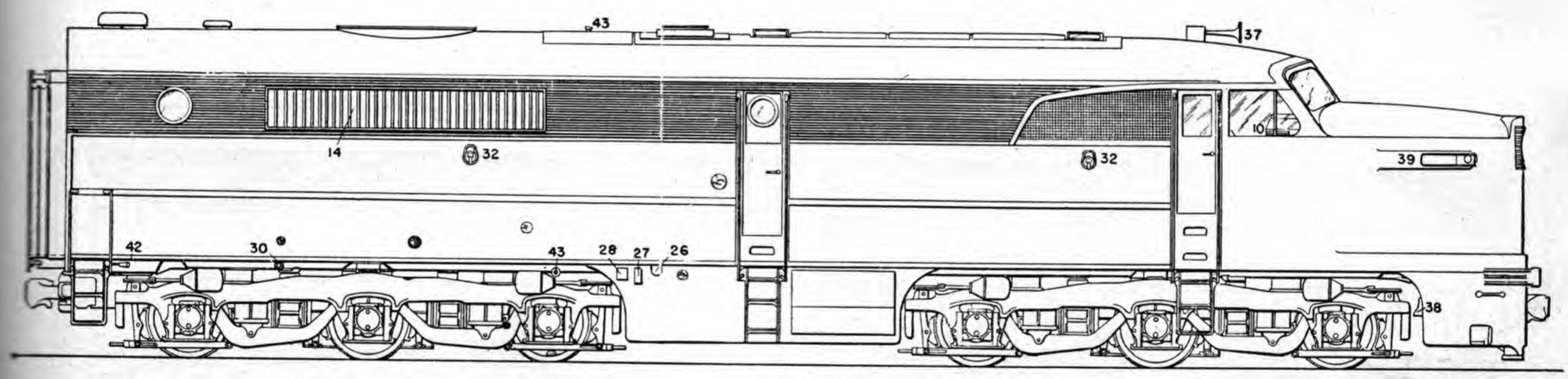


Front end (above) and rear end (below).

American Locomotive Company—General Electric Company



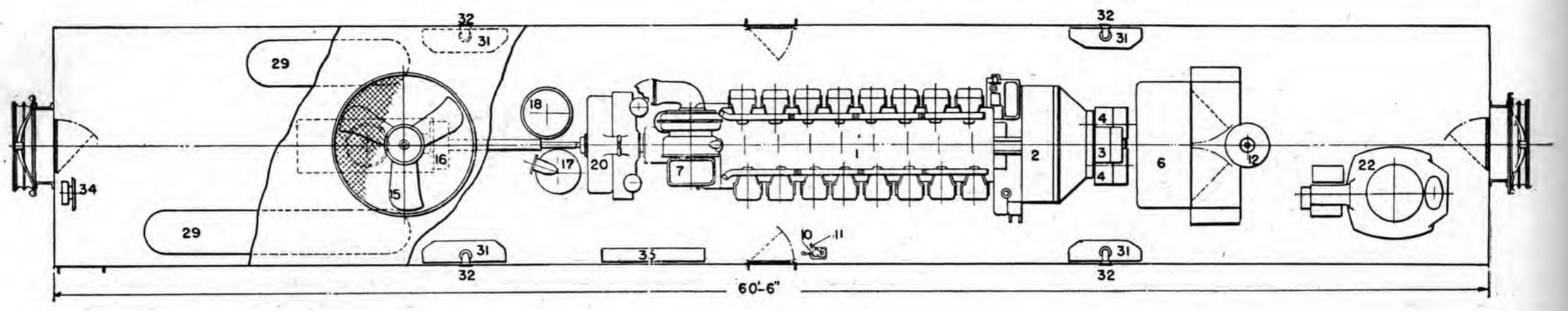


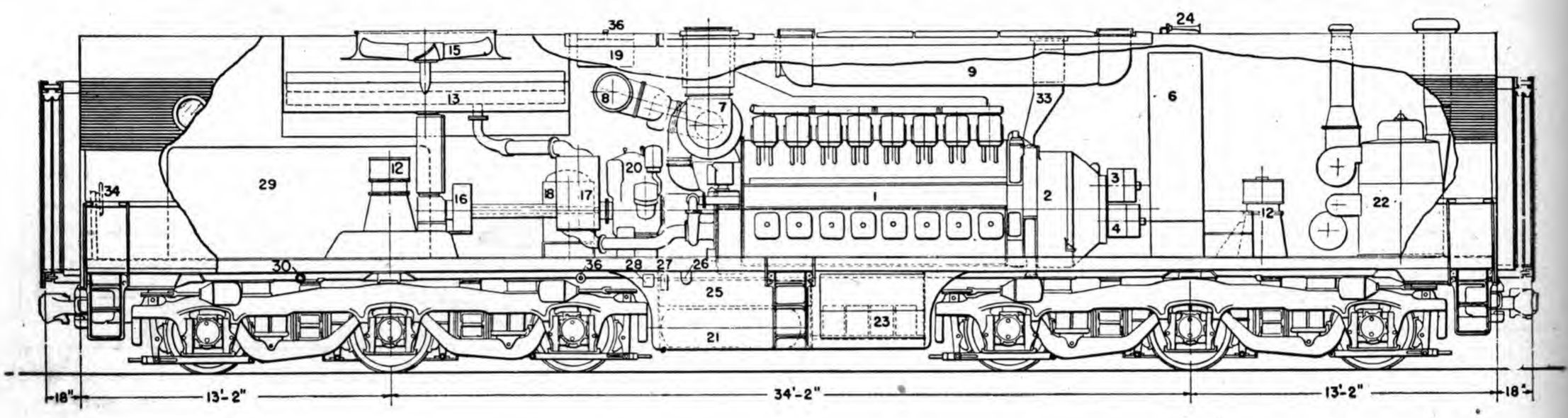


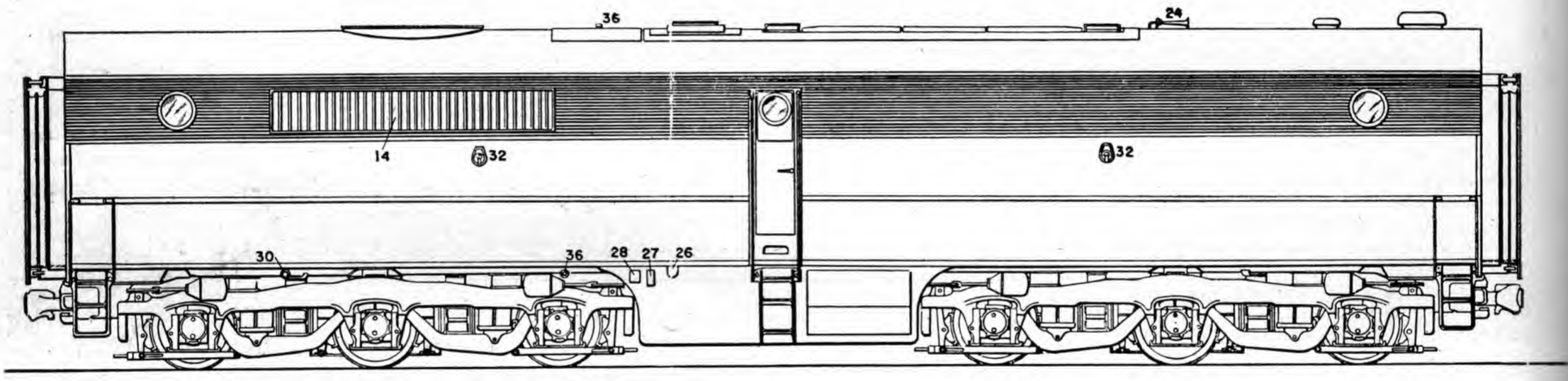
Location of Parts—Alco-G.E. 2,250-Hp. Road Passenger Locomotive, A Unit

1. Engine
2. Main generator
3. Exciter
4. Auxiliary generators
5. Traction motors
6. Contactor compartment
7. Turbo supercharger
8. Turbo supercharger filters and silencers
9. Dynamic brake grids and blowers*
10. Control stand
11. Brake valves
12. Traction motor blowers
13. Radiators
14. Radiator shutters
15. Radiator fan
16. Radiator fan clutch
17. Lubricating oil cooler
18. Lubricating oil filters
19. Engine water tank
20. Air compressor
21. Main air reservoirs
22. Steam generator
23. Batteries
24. Sanitary fixture
25. Fuel tank
26. Fuel tank filling connection
27. Fuel tank gauge
28. Emergency fuel cut off
29. Water tanks
30. Water tank filling connections
31. Sand boxes
32. Sand box filling holes
33. Generator air duct
34. Hand brake
35. Cab heaters
36. Seat
37. Horn
38. Bell
39 Number box
40. Tool box*
41. Engine control panel
42. Water filling connection for sanitary fixture
43. Engine cooling water filling connections

*** Modifications**







Location of Parts—Alco-G.E. 2,250-Hp. Road Passenger Locomotive, B Unit

1. Engine
2. Main generator
3. Exciter
4. Auxiliary generators
5. Traction motors
6. Contractor compartment
7. Turbo supercharger
8. Turbo supercharger filters and silencers
9. Dynamic brake grids and blowers*
10, Hostler control
11. Brake valve
12. Traction motor blowers
13. Radiators
14. Radiator shutters
15. Radiator fan
16. Radiator fan clutch
17. Lubricating oil cooler
18. Lubricating oil filters
19. Engine water tank
20. Air compressor
21. Main air reservoirs
22. Steam generator
23. Batteries
24. Horn
25. Fuel tank
26. Fuel tank filling connection
27. Fuel tank gauge
28. Emergency fuel cut off
29. Water tanks
30. Water tank filling connections
31. Sand boxes
32. Sand box filling holes
33. Generator air duct
34. Hand brake
35. Engine control panel
36. Engine cooling water filling connections

* Modification

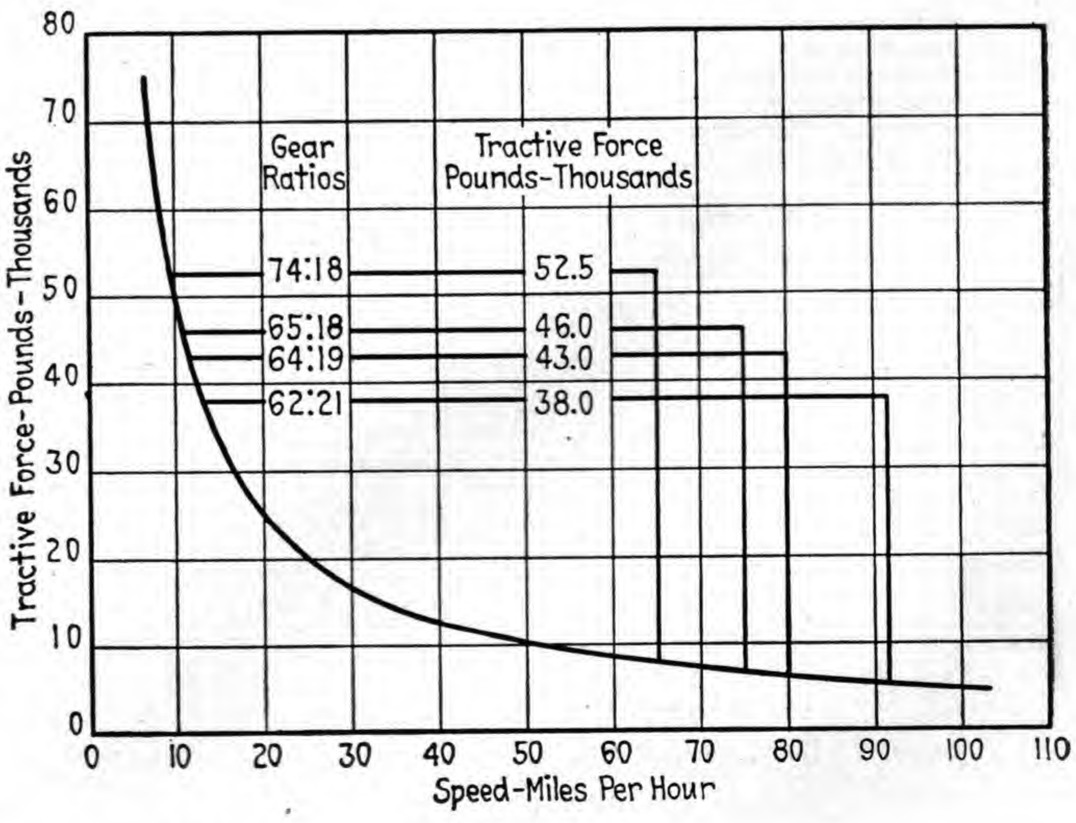
Alco-G. E. 4,800-hp. dual-purpose road locomotive.

Partial List of Railroads Using Alco-G.E. 1,500-Hp. Road Freight and 1,600-Hp. Dual-Purpose (Freight and Passenger) Locomotives

Baltimore & Ohio
Canadian Pacific
Chicago, Rock Island & Pacific
Erie
Great Northern
Green Bay & Western
Gulf, Mobile & Ohio
Lehigh & New England
Lehigh Valley
Minneapolis, St. Paul & Sault Ste. Marie
Missouri-Kansas-Texas
Missouri Pacific
New York Central
New York, New Haven & Hartford
Pennsylvania
Reading
Seaboard Air Line
Sonora Baja of California
Southeastern Rwy. of Mexico
Spokane, Portland & Seattle
St. Louis-San Francisco
Tennessee Central
Union Pacific
Wabash

Alco-G.E. 1,600-Hp. Dual-Purpose Locomotive
General Characteristics, Weights and Dimensions

Model	FA-2			
Type:				
Whyte symbol	0-4-4-0			
A.A.R. symbol	B-B			
Engines:				
Number per unit	One			
Type	12 cyl., 4-cycle, vee			
Model	Series 244			
Cylinders, bore and stroke, in.	9 by 10½			
Horsepower available for traction	1,600			
Generator:				
Make	G.E.			
Type	GT-581			
Traction motors:				
Number	4			
Make	G.E.			
Type	G.E.-752			
Journal bearings:				
Type	Roller			
Size, in. (diam.)	6½			
Wheels, diameter, in.	40			
Wheel base, ft.-in.:				
Truck	9-4			
Locomotive	38-6			
Distance between truck centers, ft.-in.	29-2			
Maximum dimensions, over-all, ft.-in.:	A Unit	B Unit		
Width	10-6½	10-6½		
Height	14-10	14-6		
Length over coupler pulling faces	53-6	52-8		
Weights in working order, lb.:				
Locomotive, total, approx.	240,000			
On drivers, approx.	240,000			
Minimum radius curvature, deg.	21			
Supplies (total capacity):				
Lubricating oil, gal.	200			
Fuel oil, gal.	1,200			
Engine cooling water, gal.	250			
Train heating water, gal. (when supplied)	1,200			
Sand, cu. ft.	22			
Air brake schedule	24RL			
Gear ratio	74:18	65:18	64:19	62:21
Starting tractive force, lb.				
Continuous rating, tractive force, lb.	52,500	46,000	43,000	38,000
Maximum speed, m.p.h.	65	75	80	92



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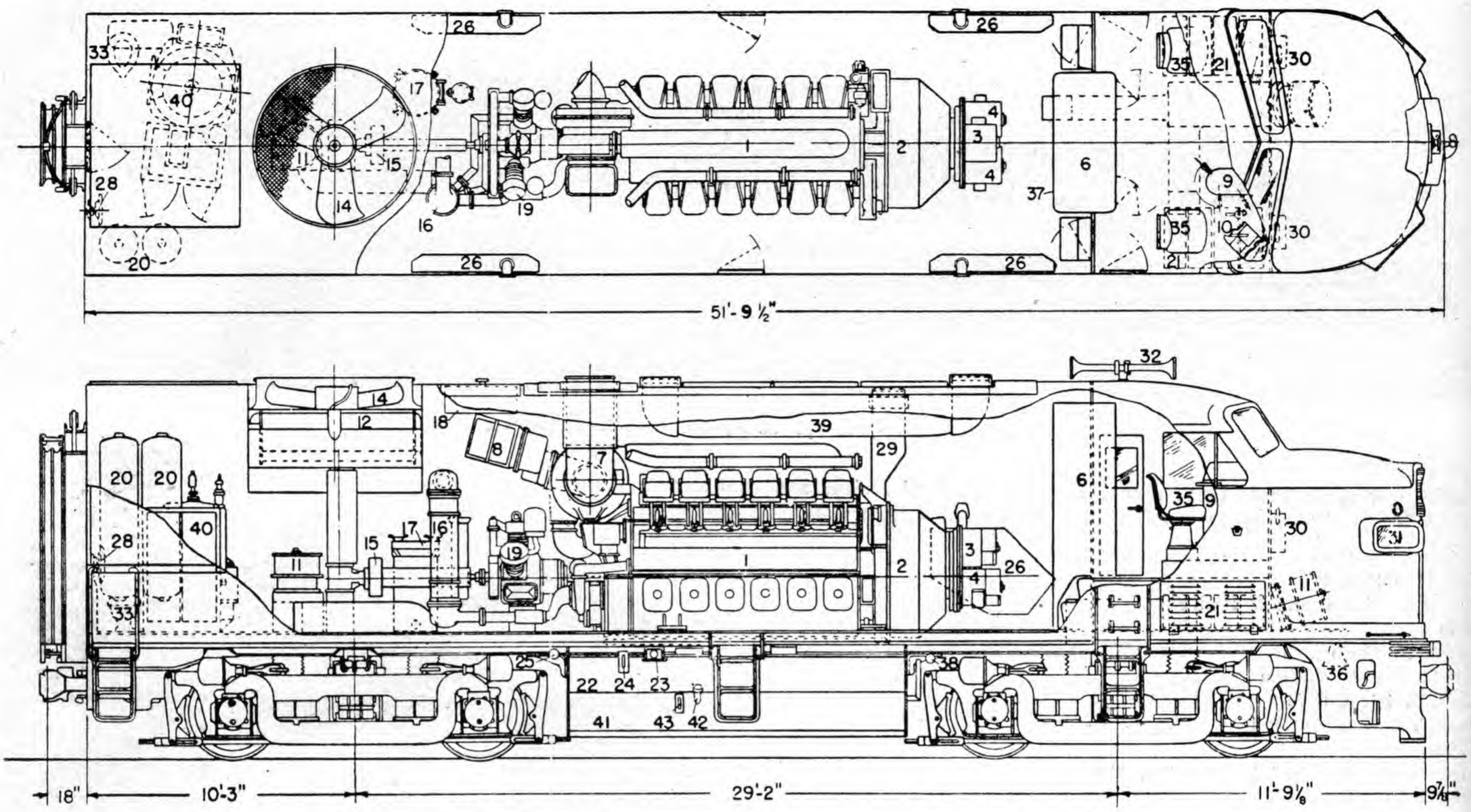
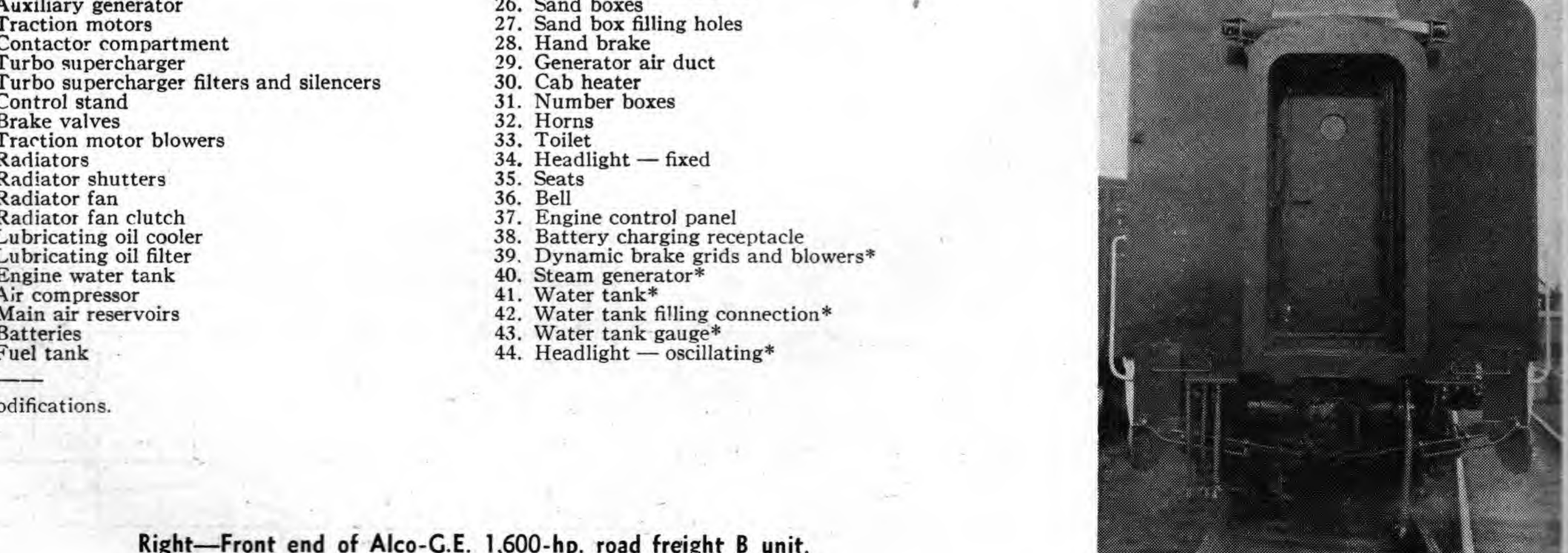
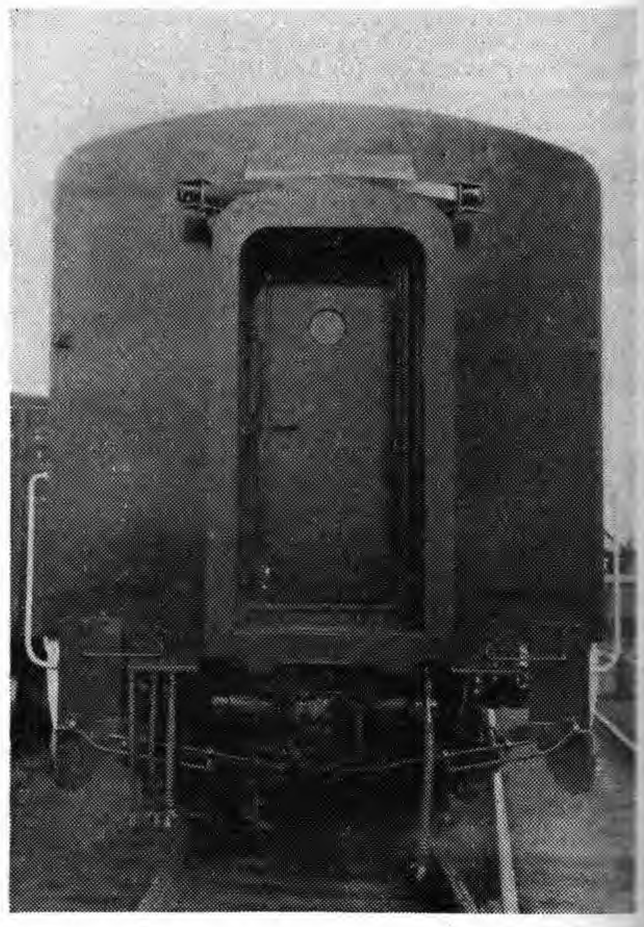




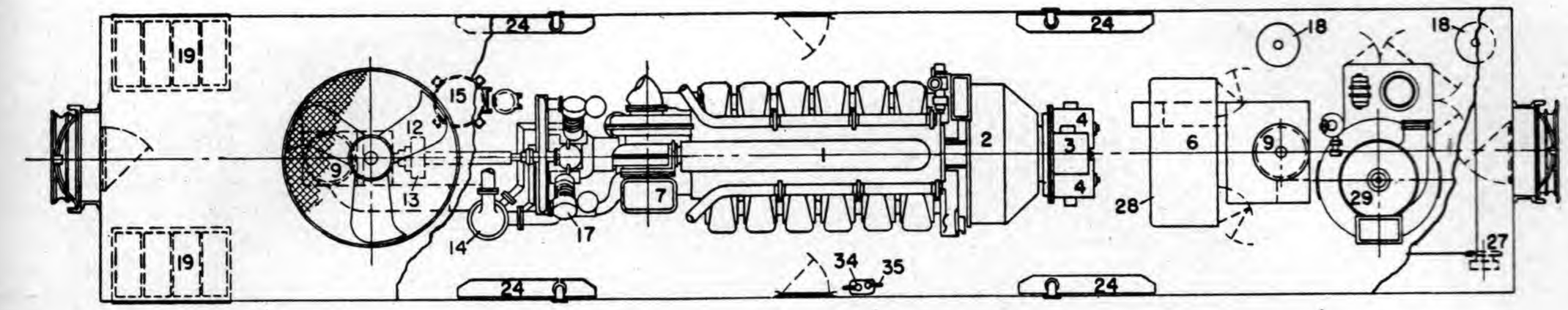
Key to Location of Parts Alco-G.E. 1,600-Hp. Dual-Purpose Locomotive—A Unit

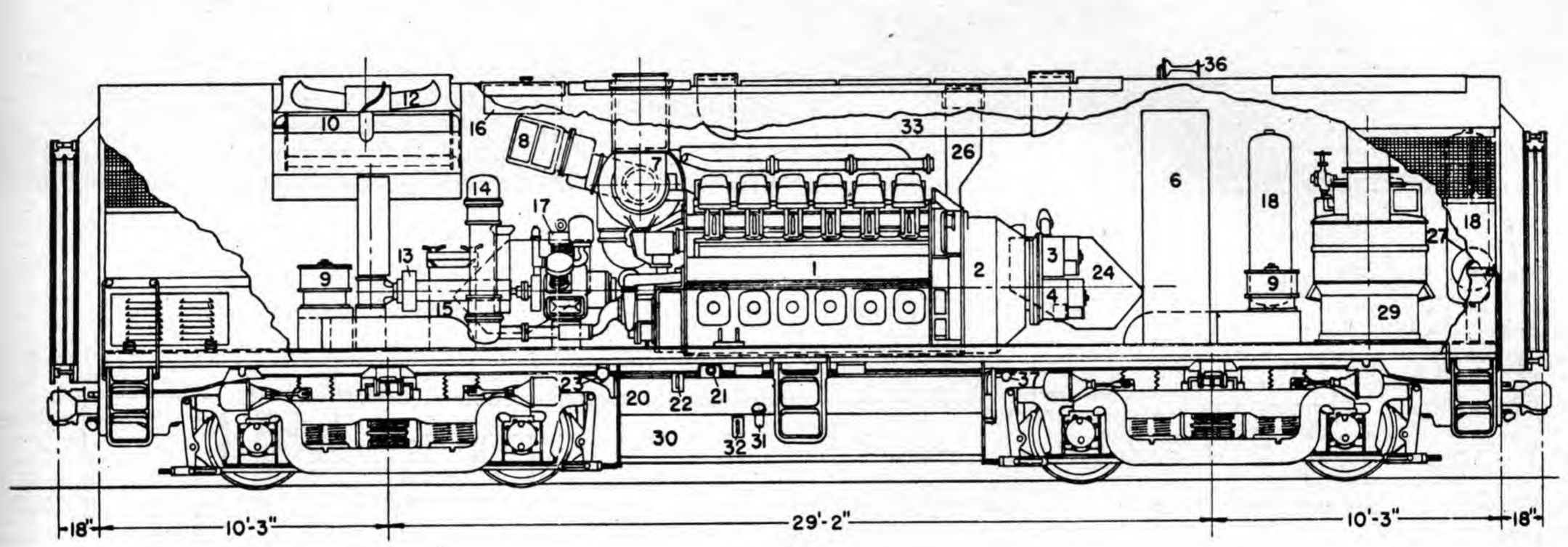
1. Engine
2. Main generator
3. Exciter
4. Auxiliary generator
5. Traction motors
6. Contactor compartment
7. Turbo supercharger
8. Turbo supercharger filters and silencers
9. Control stand
10. Brake valves
11. Traction motor blowers
12. Radiators
13. Radiator shutters
14. Radiator fan
15. Radiator fan clutch
16. Lubricating oil cooler
17. Lubricating oil filter
18. Engine water tank
19. Air compressor
20. Main air reservoirs
21. Batteries
22. Fuel tank
23. Fuel tank filling connection
24. Fuel tank gauge
25. Emergency fuel cut off
26. Sand boxes
27. Sand box filling holes
28. Hand brake
29. Generator air duct
30. Cab heater
31. Number boxes
32. Horns
33. Toilet
34. Headlight — fixed
35. Seats
36. Bell
37. Engine control panel
38. Battery charging receptacle
39. Dynamic brake grids and blowers*
40. Steam generator*
41. Water tank*
42. Water tank filling connection*
43. Water tank gauge*
44. Headlight — oscillating*

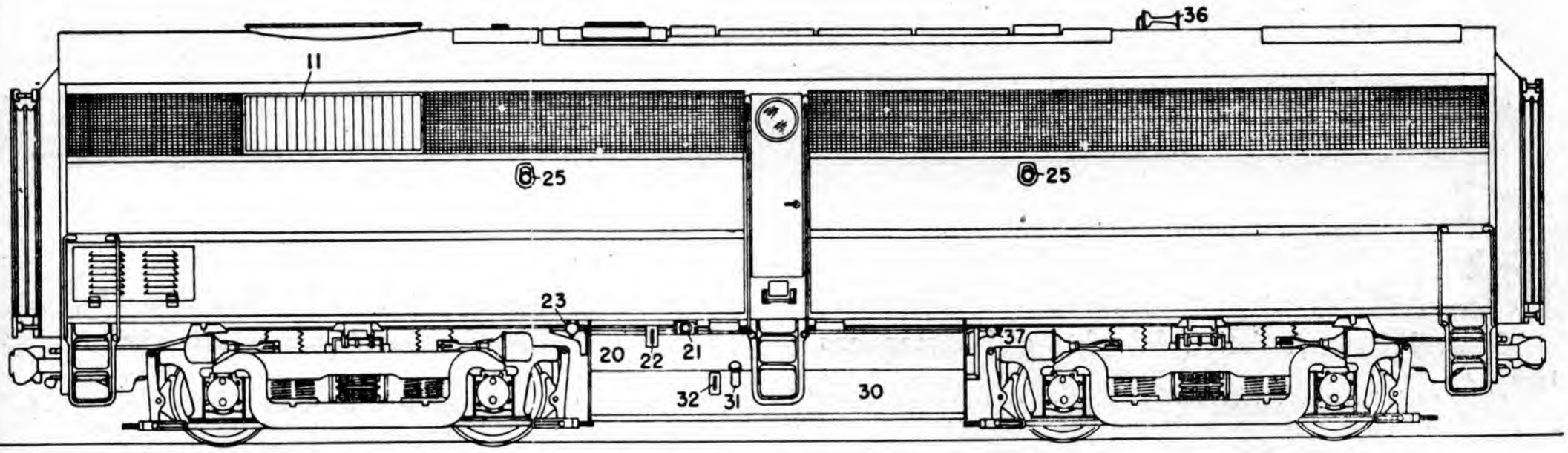
* Modifications.



Right—Front end of Alco-G.E. 1,600-hp. road freight B unit.



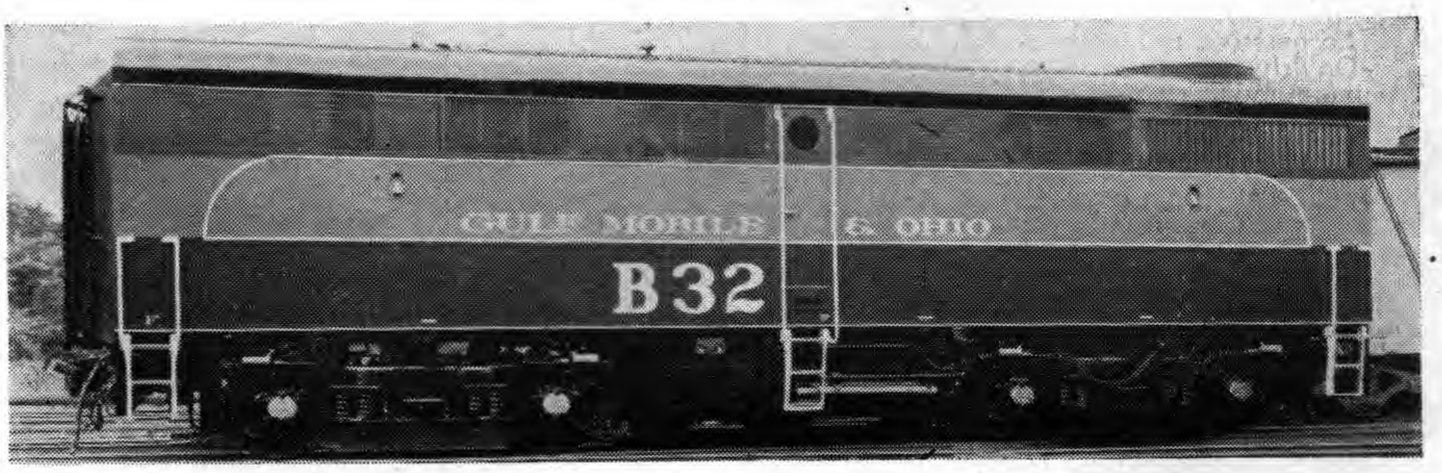




Key to Location of Parts Alco 1,600-Hp. Dual-Purpose Locomotive—B Unit

1. Engine
2. Main generator
3. Exciter
4. Auxiliary generators
5. Traction Motors
6. Contactor compartment
7. Turbo supercharger
8. Turbo supercharger filters and silencers
9 Traction motor blowers
10. Radiators
11. Radiator shutters
12. Radiator fan
13. Radiator fan clutch
14. Lubricating oil cooler
15. Lubricating oil filters
16. Engine water tank
17. Air compressor
18. Main air reservoirs
19. Batteries
20. Fuel tank
21. Fuel tank filling connection
22. Fuel tank gauge
23. Emergency fuel cut off
24. Sandboxes
25. Sandbox filling holes
26. Generator air duct
27. Hand brake
28. Engine control panel
29. Steam generator*
30. Water tank*
31 Water tank filling connection*
32 Water tank gauge*
33. Dynamic brake grids and blowers*
34. Hostler control*
35. Brake valve*
36. Horn*
37. Battery charging receptacle

* Modifications.



Alco-G.E. 1,600-hp. road freight B unit.

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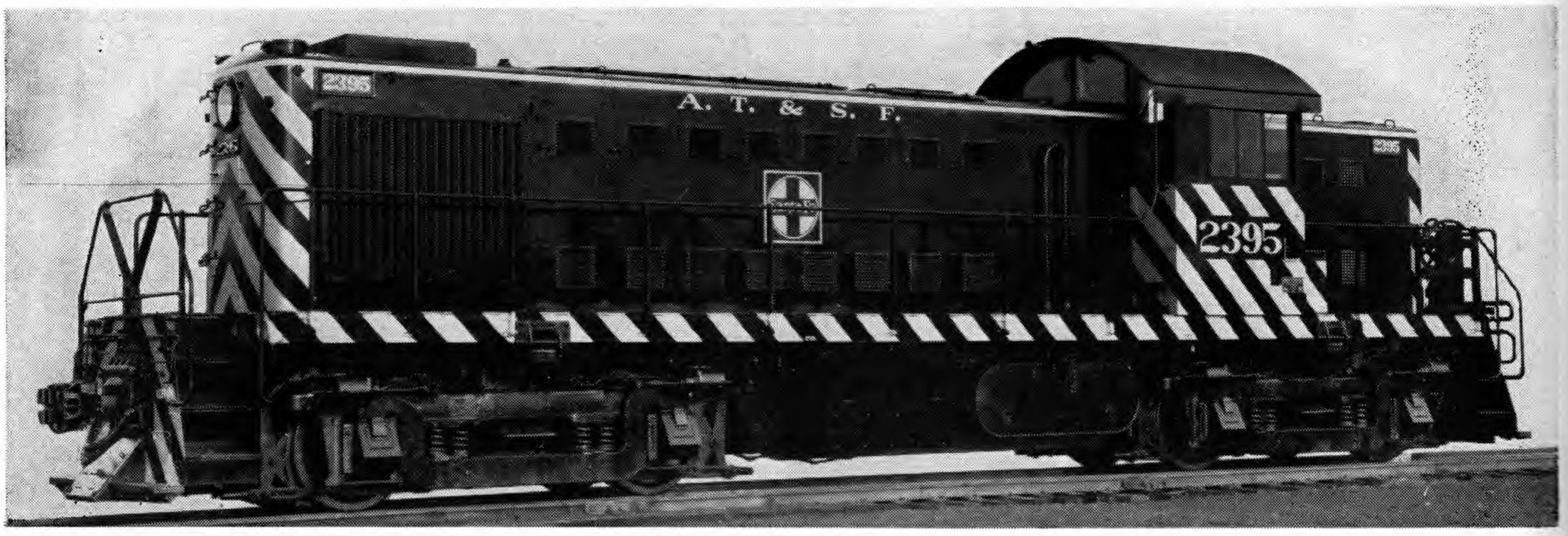

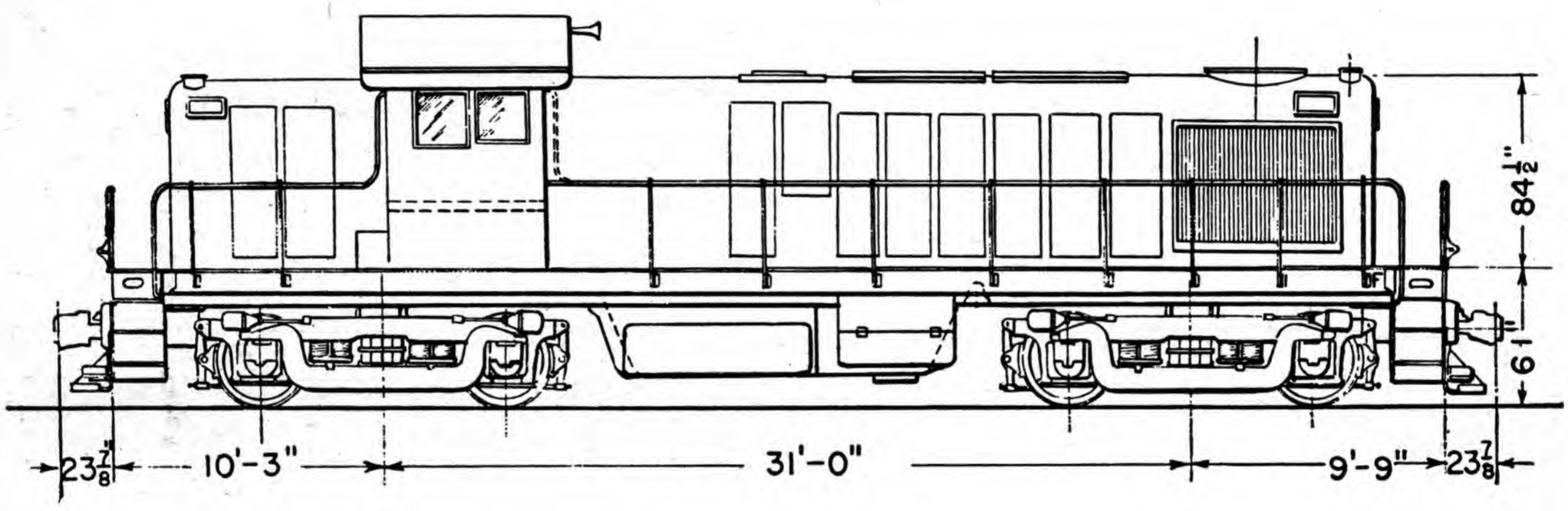

Alco-G.E. 1,000-Hp. Road Switching Locomotive General Characteristics, Weights and Dimensions

Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	6 cyl., 4-cycle, in line, supercharged
Cylinders, bore and stroke, in.	12½ by 13
Horsepower, each engine	1,000
Generator:	
Make	G.E.
Type	GT-553-A
Traction motors:	
Number	4
Make	G.E.
Type	GE-731
Journal bearings:	
Type	Plain
Size	6½ by 12
Wheels, diameter, in.	40
Wheel base, ft.-in.:	
Truck	9-4
Locomotive	40-4
Distance between truck centers, ft.-in.	31-0
Maximum dimensions, over-all, ft.-in.:	
Width	10-0
Height	14-6
Length over coupler pulling faces	54-11¾
Weights in working order, lb.:	
Locomotive, total, approx.	240,000
On drivers, approx.	240,000
Minimum radius curvature, ft.	100
Supplies (total capacity):	
Lubricating oil, gal.	80
Fuel oil, gal.:	
With steam generator	800
Without steam generator	1,600
Engine cooling water, gal.	240
Train heating water, gal. (when supplied)	800
Sand, cu. ft.	27
Air brake schedule	14EL
Gear ratio	75:16
Starting tractive force, lb. (30 per cent adhesion)	72,000
Continuous rating, tractive force, lb	34,000
Maximum speed, m.p.h.	60

Partial List of Railroads Using Alco-G.E. 1,000-Hp. Road Switching Locomotive

Akron, Canton & Youngstown
Alabama, Tennessee & Northern
Alton
Atchison, Topeka & Santa Fe
Atlanta & St. Andrews Bay
Chicago & Eastern Illinois
Chicago & Northwestern
Chicago & Western Indiana
Chicago, Milwaukee, St. Paul & Pacific
Chicago, Rock Island & Pacific
Duluth, South Shore & Atlantic
Great Northern
Gulf, Mobile & Ohio
Illinois Terminal
Kansas City Southern
Lake Erie, Franklin & Clarion
Long Island
Midland Continental
Minneapolis & St. Louis
New York Central
New York, New Haven & Hartford
New York, Susquehanna & Western
Northern Pacific
Pennsylvania
Spokane International
Spokane, Portland & Seattle
Tennessee Coal Iron & R. R.
Washington Terminal

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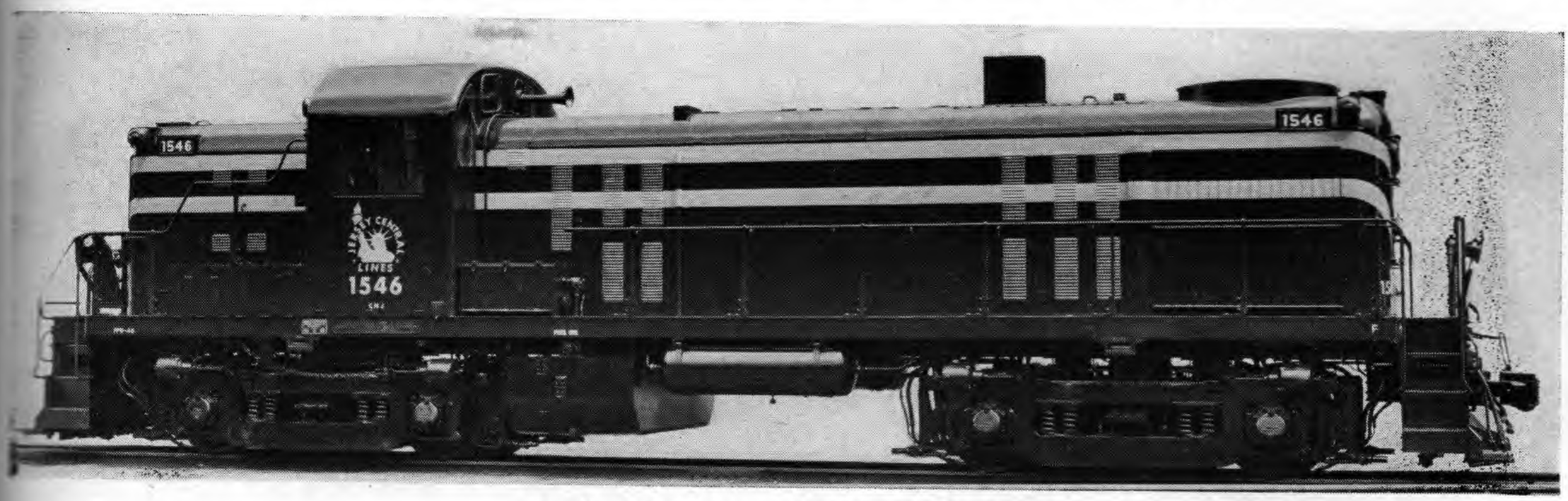
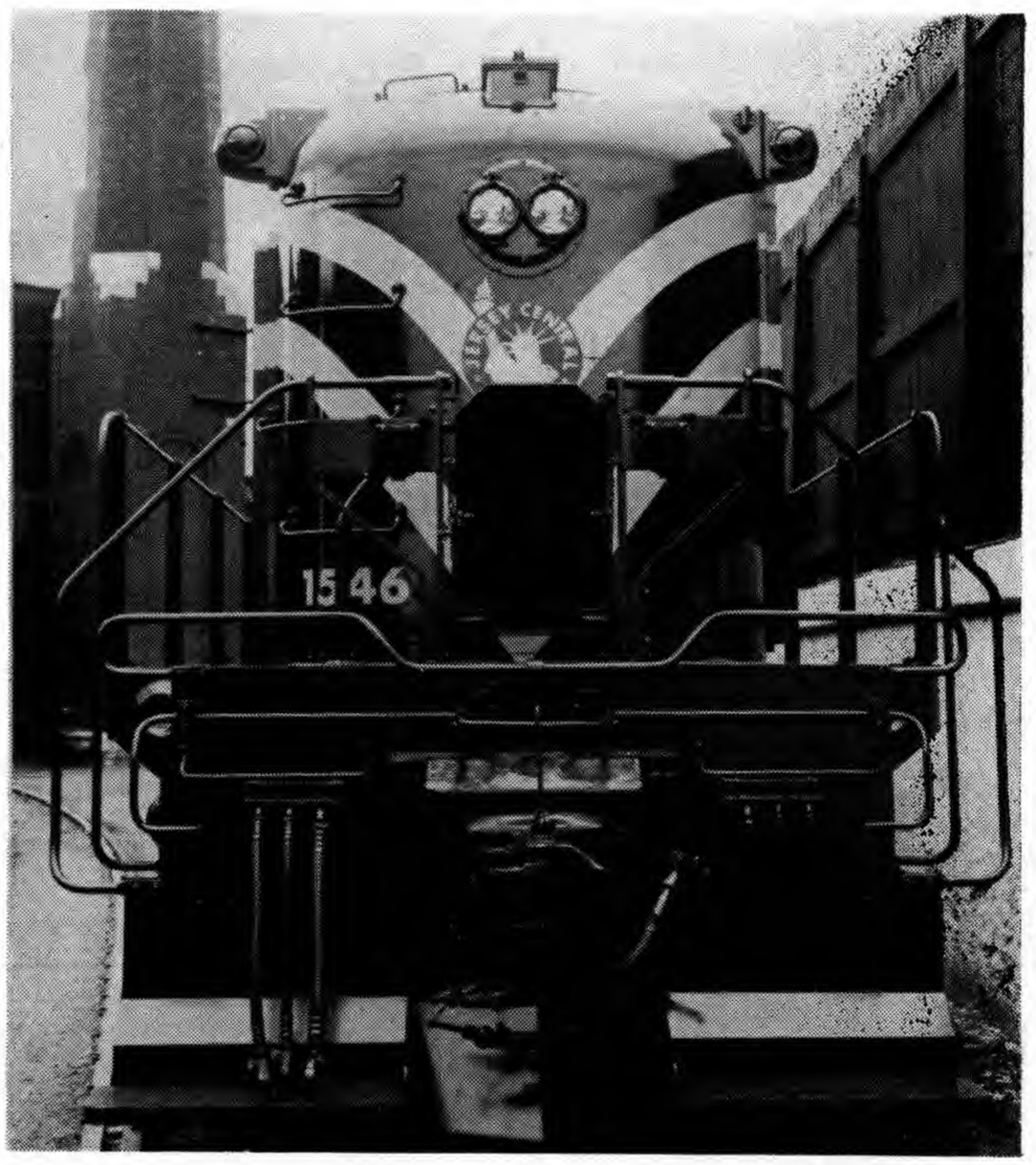


Alco-G. E. 1,600-hp. road switching locomotive.

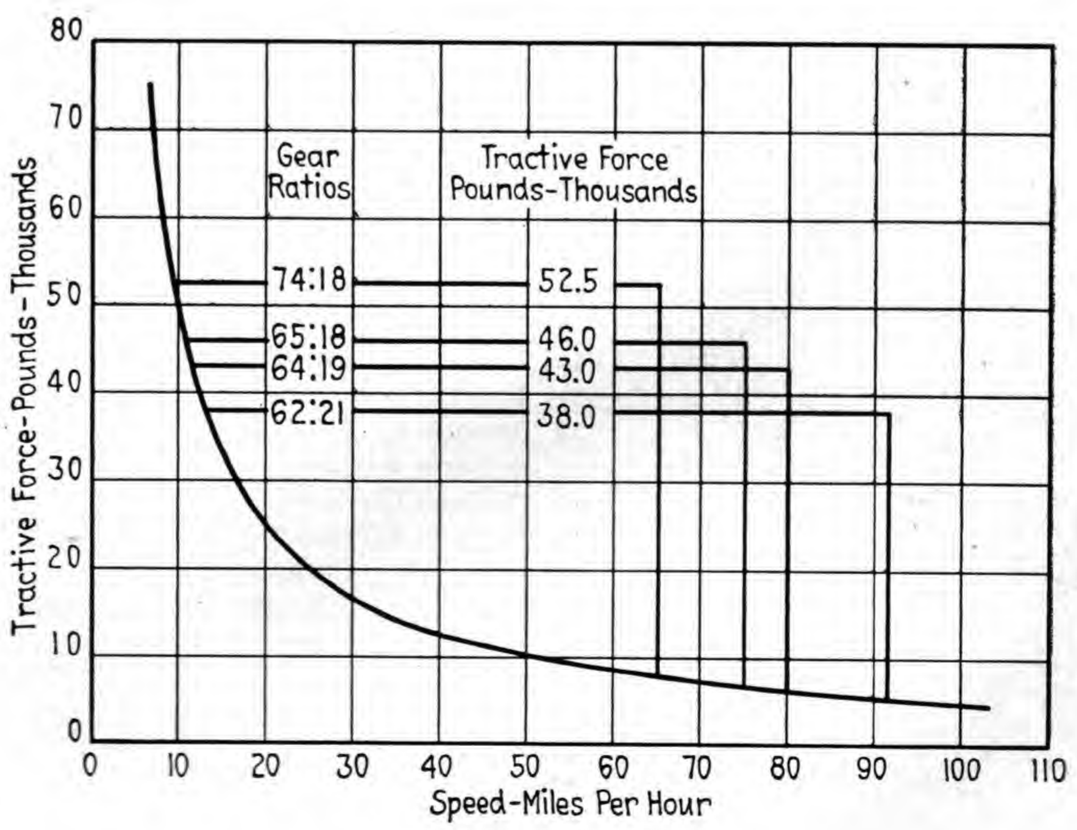
Partial List of Railroads Using Alco-G.E. 1,500-Hp. and 1,600-Hp. Road Switching Locomotives

Alton & Southern
Atlantic & Danville
Belt Railway of Chicago
Birmingham Southern
Boston & Maine
Canadian Pacific
Carolina & Northwestern
Central of Georgia
Central R.R of New Jersey
Central R.R. of Pennsylvania
Chesapeake & Ohio
Chicago & Northwestern
Chicago Great Northern
Chicago, Indianapolis, & Louisville
Chicago, Milwaukee, St. Paul & Pacific
Chicago, Rock Island & Pacific
Danville & Western
Delaware & Hudson
Detroit & Mackinac
Elgin, Joliet & Eastern
Erie
Great Northern
Green Bay & Western
Gulf, Mobile & Ohio
Lake Superior & Ishpeming
Lehigh & Hudson
Lehigh & New England
Lehigh Valley
Macon, Dublin & Savannah
Maine Central
Minneapolis, St. Paul & Sault Ste. Marie
Missouri & Illinois
New York Central
New York, New Haven & Hartford
Ontario Northland
Roberval & Saguenay
Seaboard Air Line
Southern
Spokane, Portland & Seattle
St. Louis & Belleville Electric
St. Louis-San Francisco
Texas & Pacific
Texas Pacific—Missouri Pacific
Toledo, Peoria & Western
Union Pacific
Union
Western Maryland
Youngstown & Northern



Alco-G.E. 1,600-Hp. Road Switching Locomotive General Characteristics, Weights and Dimensions

Model	RS-3			
Type:				
Whyte symbol	0-4-4-0			
A.A.R. symbol	B-B			
Engines:				
Number per unit	One			
Type	12 cyl., 4-cycle, vee			
Model	Series 244			
Cylinders, bore and stroke, in.	9 by 10½			
Horsepower available for traction	1,600			
Generator:				
Make	G.E.			
Type	GT-581			
Traction motors:				
Number	4			
Make	G.E.			
Type	GE-752			
Journal bearings:				
Type	Plain			
Size, in.	6½ by 12			
Wheels, diameter, in.	40			
Wheel base, ft.-in.:				
Truck	9-4			
Locomotive	39-4			
Distance between truck centers, ft.-in.	30-0			
Maximum dimensions, over-all, ft.-in.:				
Width	10-0¼			
Height	14-5⅛			
Length over coupler pulling faces	55-11¾			
Weights in working order, lb.:				
Locomotive, total, approx.	240,000			
On drivers, approx.	240,000			
Minimum radius curvature, deg. (with train)	21			
Supplies (total capacity):				
Lubricating oil, gal.	200			
Fuel oil, gal.	800			
Engine cooling water, gal.	250			
Train heating water, gal. (when supplied)	800			
Sand, cu. ft.	28			
Air brake schedule	6-SL			
Gear ratio	74:18	65:19	64:19	62:21
Continuous rating, tractive force, lb.	52,500	46,000	43,000	38,000
Maximum speed, m.p.h.	65	75	80	92



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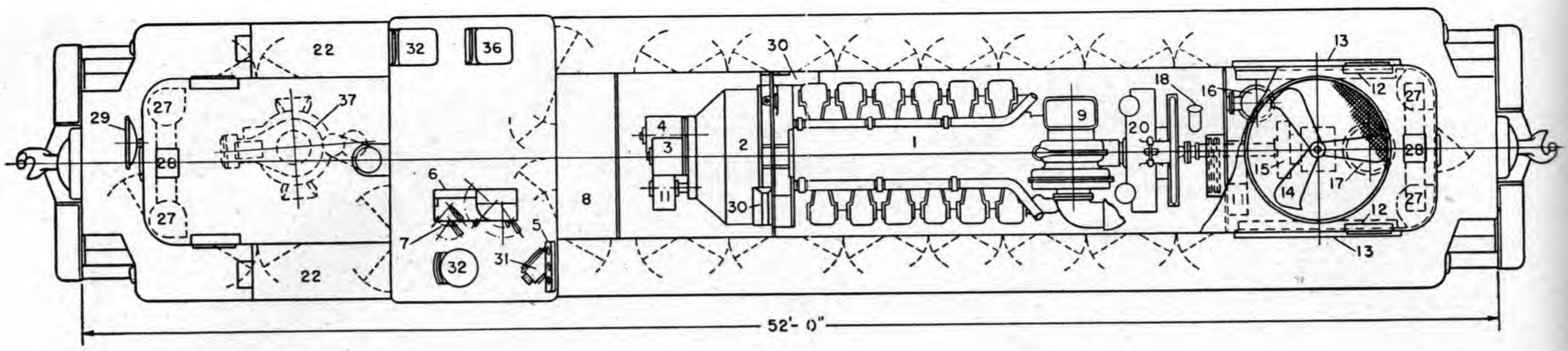


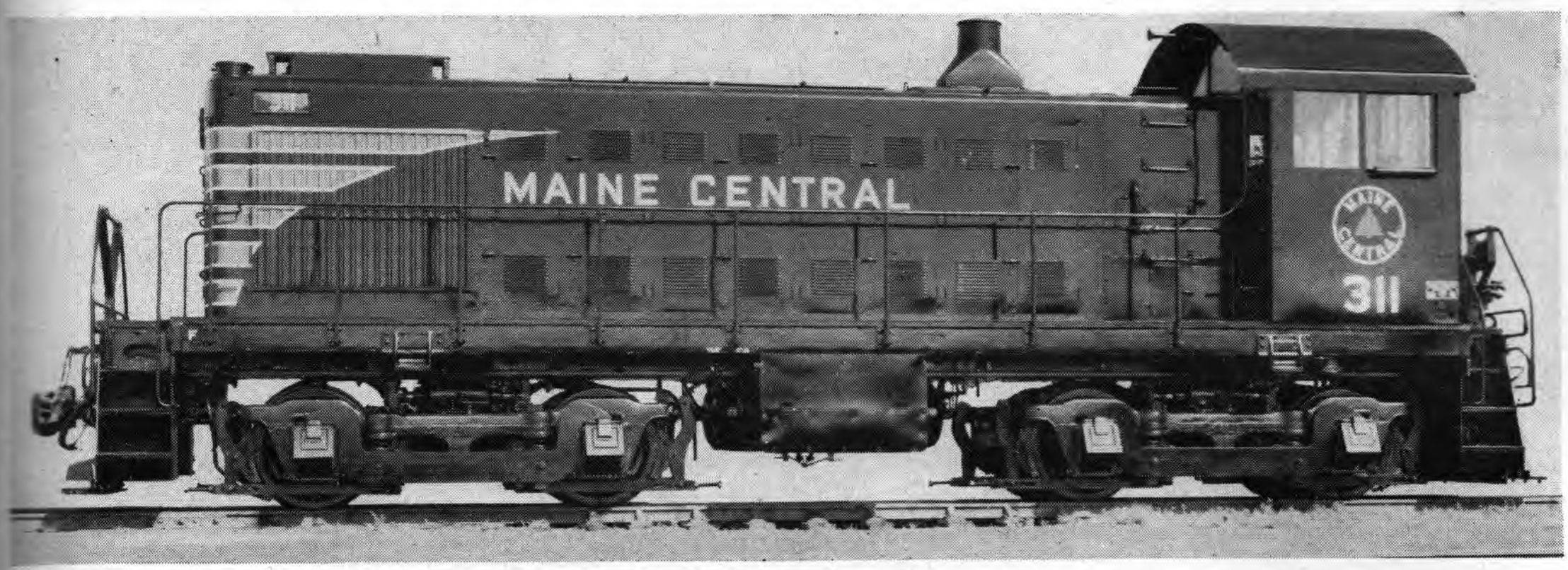
Alco-G. E. 1,600-hp. road switching locomotive Model RS-3. This locomotive also built with six-wheel trucks, four motors per locomotive as Model RS-C3.

Key to Location of Parts Alco 1,600-Hp. Road Switching Locomotive

1. Engine
2. Main generator
3. Exciter
4. Auxiliary generator
5. Gauge panel
6. Control stand
7. Brake valves
8. Control compartment
9. Turbo supercharger
10. Turbo supercharger filters and silencers
11. Traction motor blowers
12. Radiators
13. Radiator shutters
14. Radiator fan
15. Radiator fan clutch
16. Lubricating oil cooler
17. Lubricating oil filters
18. Lubricating oil strainer
19. Engine water tank
20. Air compressor
21. Main air reservoir
22. Batteries
23. Fuel tank
24. Fuel tank filling connection
25. Fuel tank gauge
26. Emergency fuel cut off
27. Sand boxes
28. Sand box cover
29. Hand brake
30. Generator air ducts
31. Cab heater
23. Cab seats
33. Horn
34. Bell
35. Number boxes
36. Cab seat*
37. Steam generator*
38. Water tank*
39. Water tank filling connection*
40. Water tank gauge*

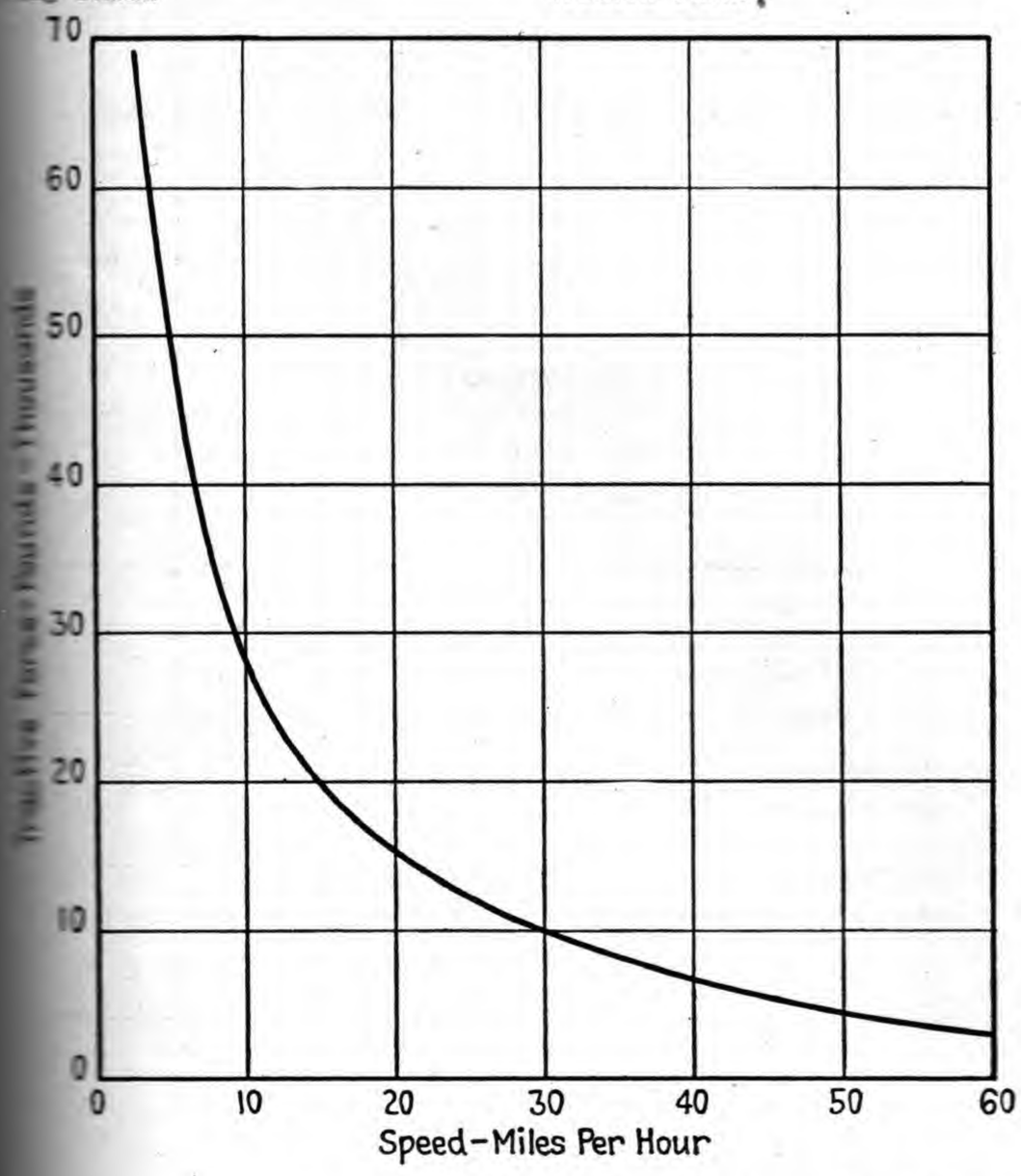
* Modifications.

American Locomotive Company—General Electric Company



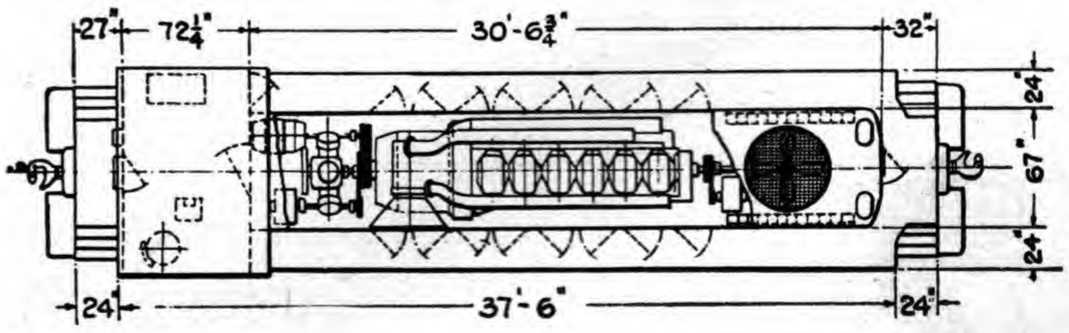
Partial List of Railroads Using Alco-G.E. 1,000-Hp. Switching Locomotive

Alton
Atchison, Topeka & Santa Fe
Atlantic Coast Line
Baltimore & Ohio
Birmingham Southern
Boston & Maine
Canadian Pacific
Central of Georgia
Central R. R. of New Jersey
Chesapeake & Ohio
Chicago and Northwestern
Chicago, Burlington & Quincy
Chicago Great Northern
Chicago, Milwaukee, St. Paul & Pacific
Chicago, Rock Island & Pacific
Chicago, St. Paul, Minneapolis & Omaha
Delaware & Hudson
Delaware, Lackawanna & Western
Denver, Rio Grande Western
Elgin, Joliet & Eastern
Erie
Grand Trunk Western (Can. National)
Great Northern
Green Bay & Western
Gulf, Mobile & Ohio
Illinois Terminal
International Great Northern
Lehigh and New England
Lehigh Valley
Long Island
Louisville & Nashville
Maine Central
Minneapolis & St. Louis
Minneapolis, St. Paul & Sault Ste. Marie
Missouri Pacific
Monongahela Connecting
Nashville, Chattanooga & St. Louis
New York Central
New York, Chicago & St. Louis (Nickel Plate)
New York, New Haven & Hartford
New York, Susquehanna & Western
Northern Pacific
Northern Pacific Terminal of Oregon
Pennsylvania
Pittsburgh & Lake Erie
Reading
Richmond, Fredericksburg & Potomac
Seaboard Air Line
Southern Pacific
Southern
St. Louis—San Francisco
Terminal Rwy. Assn. of St. Louis
Texas Pacific—Missouri Pacific
Union Pacific
Union
Wabash
Western Maryland
Western Pacific

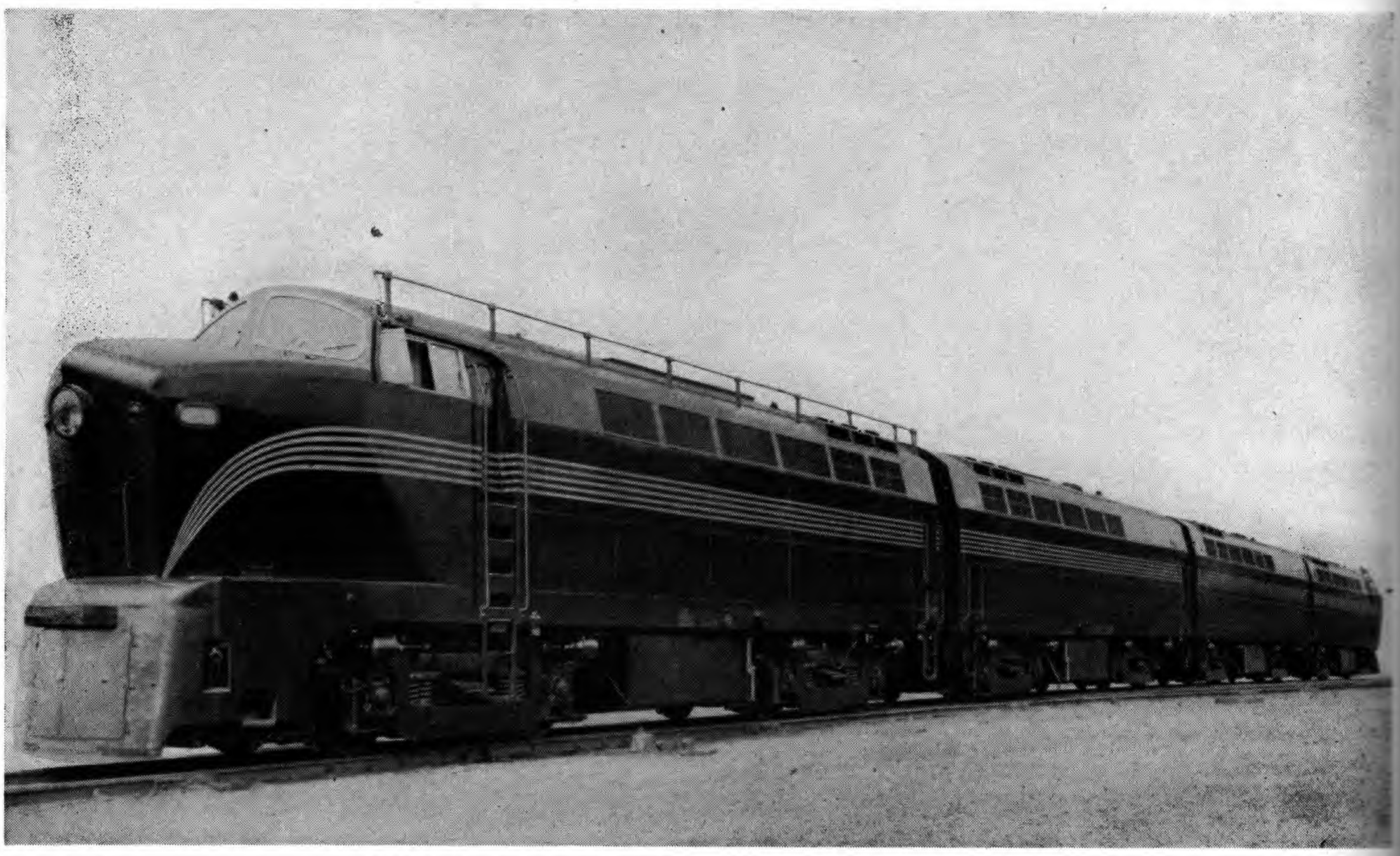


General Characteristics, Weights and Dimensions Alco-G.E. 1,000-Hp. Switching Locomotive

Track gauge, ft.-in.	4-8½
Wheel arrangement	0-4-4-0
No. of engines per cab	One
Horsepower available for traction	1,000
Journal bearings: Type	Friction
Size	6½ by 12
Wheels: Driving, pairs	Four
Idling, pairs	0
Diameter, in.	40
Wheel base: Truck, ft.-in.	8
Locomotive, total, ft.-in.	30-6
Underframe construction	Welded steel
Weights, in working order, lb.:	
Locomotive, total	230,000
On drivers	230,000
Light	220,000
Truck, complete	35,000
Maximum overall dimensions, ft.-in.:	
Width	10-0
Height	14-6
Length, inside knuckles	45-5¾
Minimum radius curvature	50 ft.
Supplies (total capacity):	
Lubricating oil, gal.	80
Fuel oil, gal.	635
Engine cooling water, gal.	240
Sand, cu. ft.	27
Air brake schedule	14 EL
Gear ratio	75:16
Continuous-rating t.f. lb.	34,000
Continuous-rating speed, m.p.h.	8
Maximum speed, m.p.h.	60
Starting tractive force (at 30 per cent adhesion), lb.	69,000



American Locomotive Company—General Electric Company



Baldwin-Westinghouse 6,400-hp. locomotive with four RF-16 units.

Baldwin-Westinghouse 1,600-Hp. Road Freight Locomotive General Characteristics, Weights and Dimensions

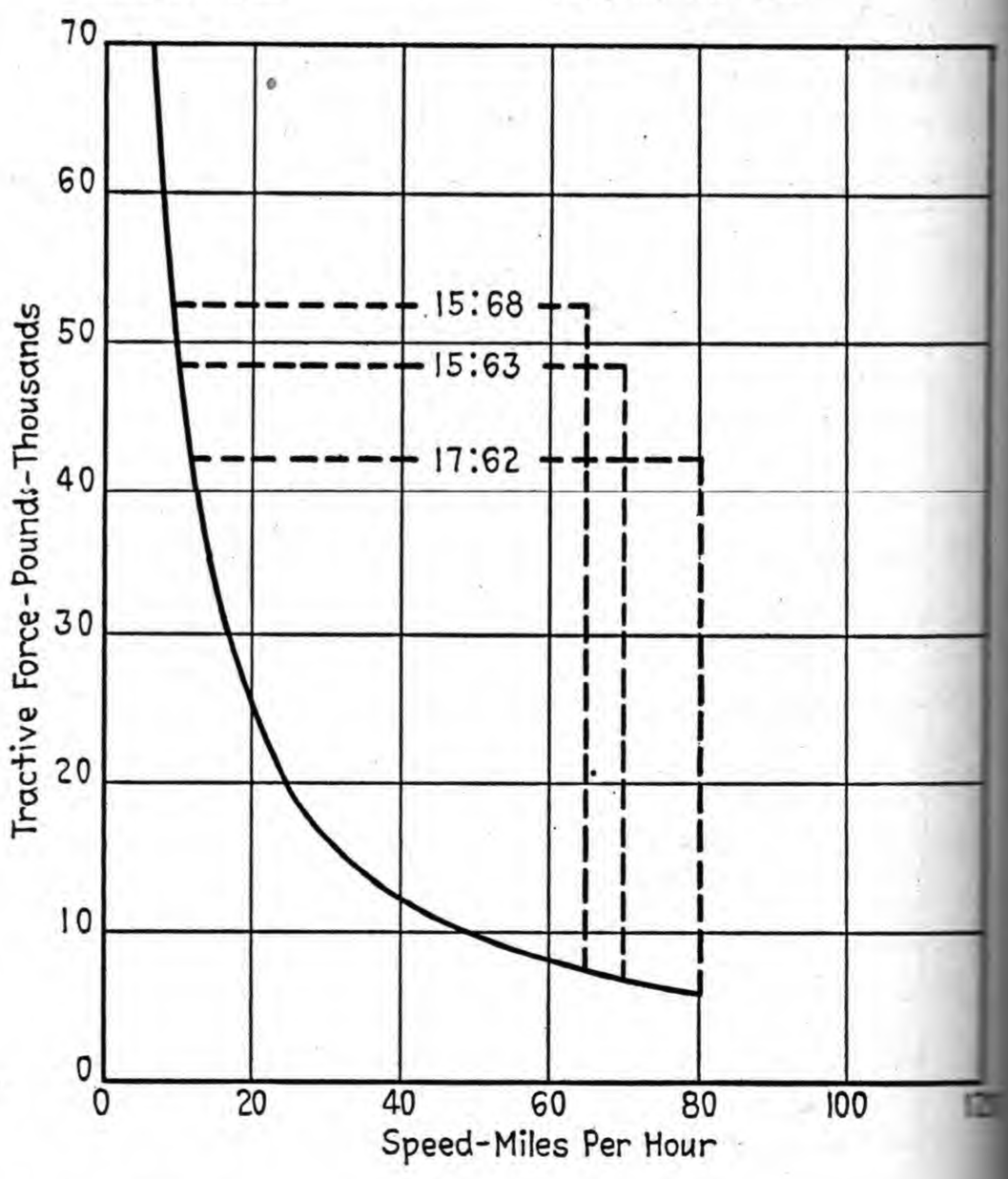
Model	RF-16
Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	8 cyl., 4 cycle, in line
Cylinders, bore and stroke, in.	12¾ by 15½
Horsepower available for traction	1,600
Generator:	
Make	Westinghouse
Type	471
Traction motors:	
Number	4
Make	Westinghouse
Type	370
Journal bearings:	
Type	Roller
Size	6½ by 12
Wheels, diameter, in.	42
Wheel base, ft.-in.:	
Truck	9-10
Locomotive	38-0
Distance between truck centers, ft.-in.	28-2
Maximum dimensions, over-all, ft.-in.:	
Width	10-6
Height	15-0
Length over coupler pulling faces:	
A Unit	54-8
B Unit	53-2
Weights in working order, lb.:	

	A Unit	B Unit
Locomotive, total, approx.	248,000	244,000
On drivers, approx.	248,000	244,000

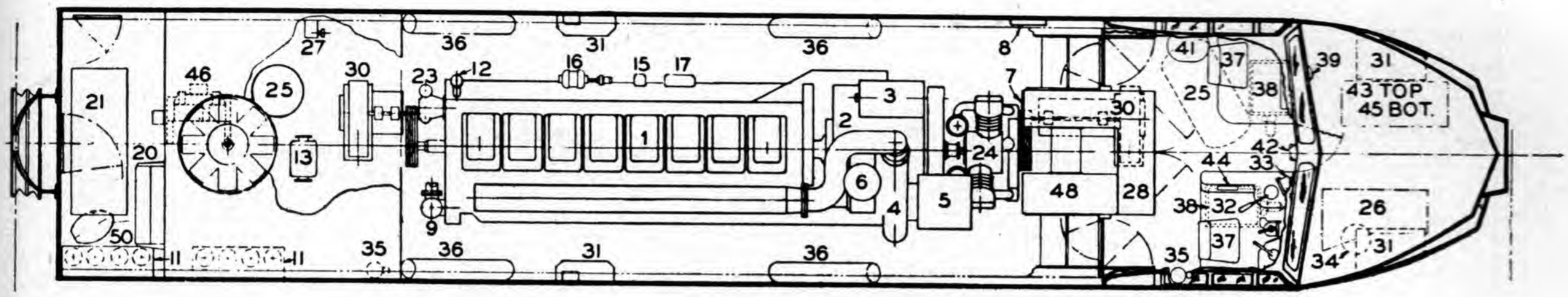
Minimum radius curvature, deg. (with train)	21
Supplies (total capacity):	
Lubricating oil, gal.	200
Fuel oil, gal.	1,200
Engine cooling water, gal.:	
A Unit	300
B Unit	370
Sand, cu. ft.	16
Air brake schedule	24RL
Gear Ratio	See curve
Starting tractive force, lb. (25 per cent adhesion):	
A Unit	62,000
B Unit	61,000
Continuous rating, tractive force, lb.	See curve
Maximum speed, m.p.h.	See curve

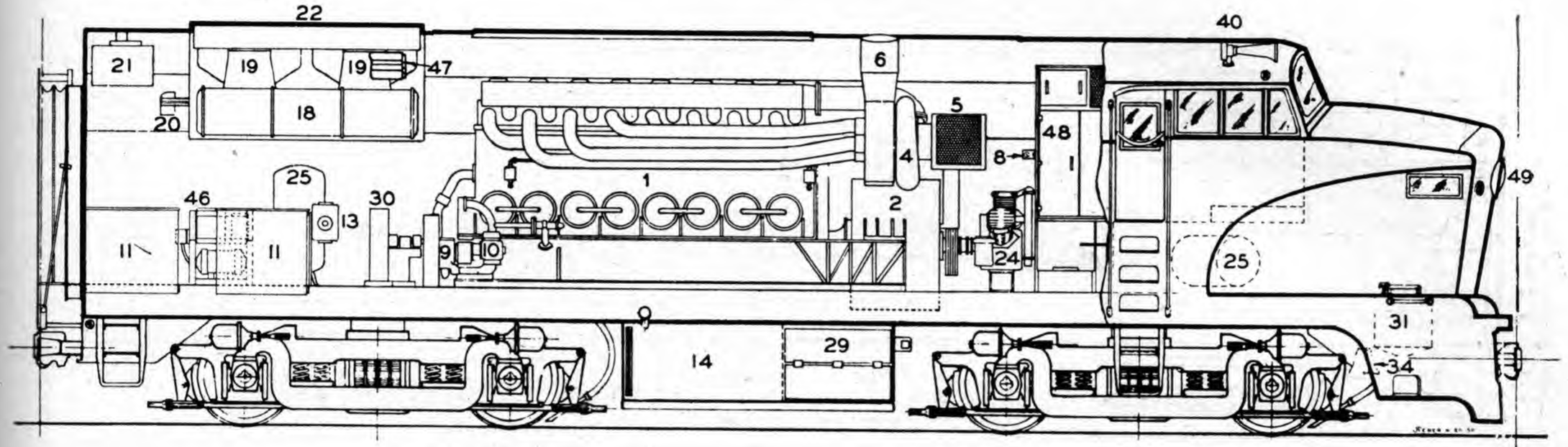
Partial List of Railroads Using Baldwin-Westinghouse 1,500-Hp., 1,800-Hp., 2,000-Hp. and 3,000-Hp. Road Locomotives

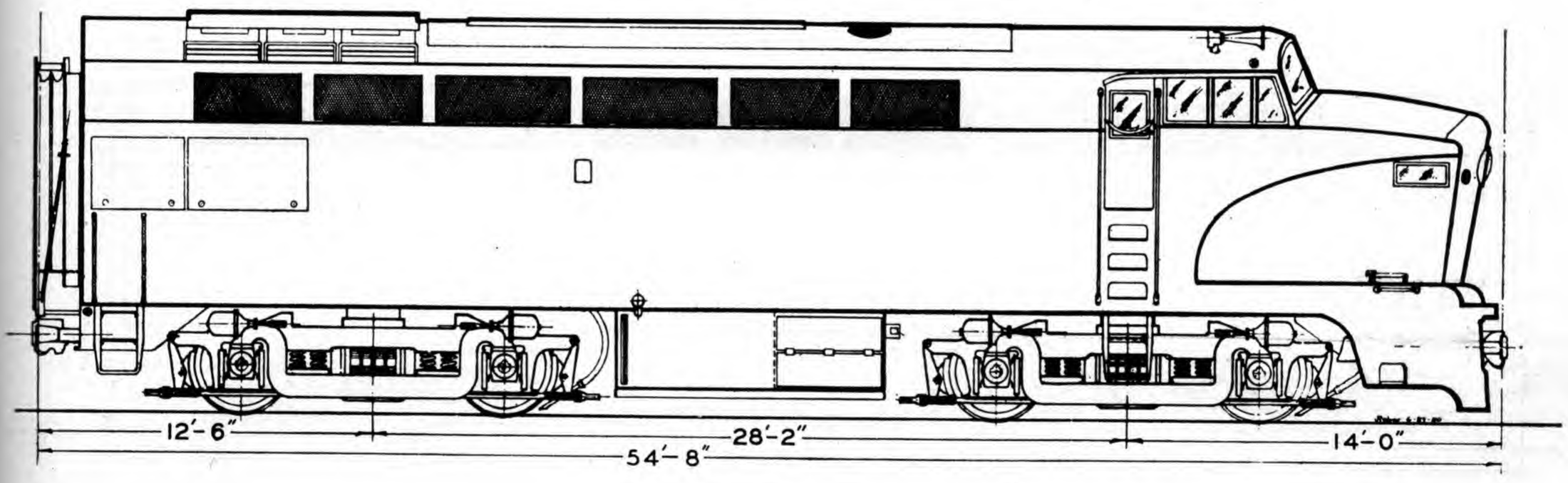
Baltimore & Ohio
Gulf, Mobile & Ohio
Jersey Central Lines
Missouri Pacific
National Railways of Mexico
New York Central
Pennsylvania
Seaboard Air Line



The Baldwin Locomotive Works



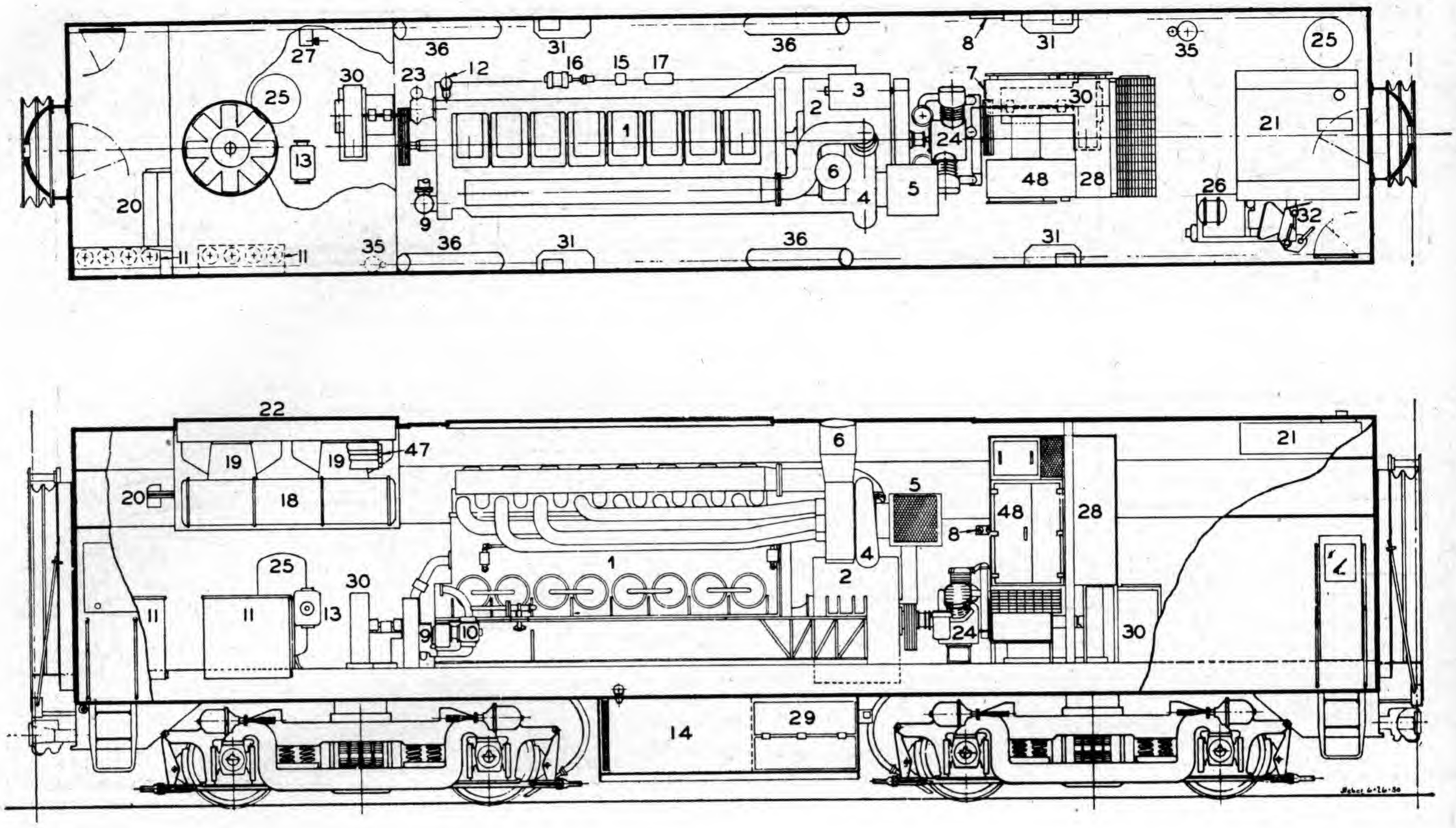




Location of Parts—Baldwin-Westinghouse 1,600-Hp. Road Freight Locomotive—A Unit

1. Engine
2. Main generator
3. Auxiliary generator & exciter
4. Turbocharger
5. Air intake filter
6. Diesel engine exhaust stack
7. Engine control panel
8. Engine control gauges
9. Lube oil suction strainer
10. Lube oil pump
11. Lube oil filter
12. Lube oil fill
13. Heat exchanger—Lube oil cooler
14. Fuel oil tank
15. Fuel suction strainer
16. Fuel supply pump
17. Fuel pressure filter
18. Radiators—Engine cooling water
19. Radiator fan with motor
20. Temperature control equipment
21. Expansion tank—Engine cooling water
22. Radiator air discharge
23. Water pump
24. Air compressor
25. Air reservoirs
26. Air brake equipment
27. Hand brake
28. Electrical equipment cabinet
29. Storage battery box
30. Traction motor blower
31. Sand box
32. Operating controls
33. Speed indicator
34. Bell
35. Fire extinguisher (portable)
36. Fire extinguisher (fixed)*
37. Seat
38. Cab heater
39. Alarm bell
40. Air horn
41. Water cooler*
42. Cab signal*
43. Cab signal equipment*
44. Train phone*
45. Train phone equipment*
46. Motor generator set*
47. Dynamic brake resistors*
48. Dynamic brake equipment*
49. Headlight
50. Toilet

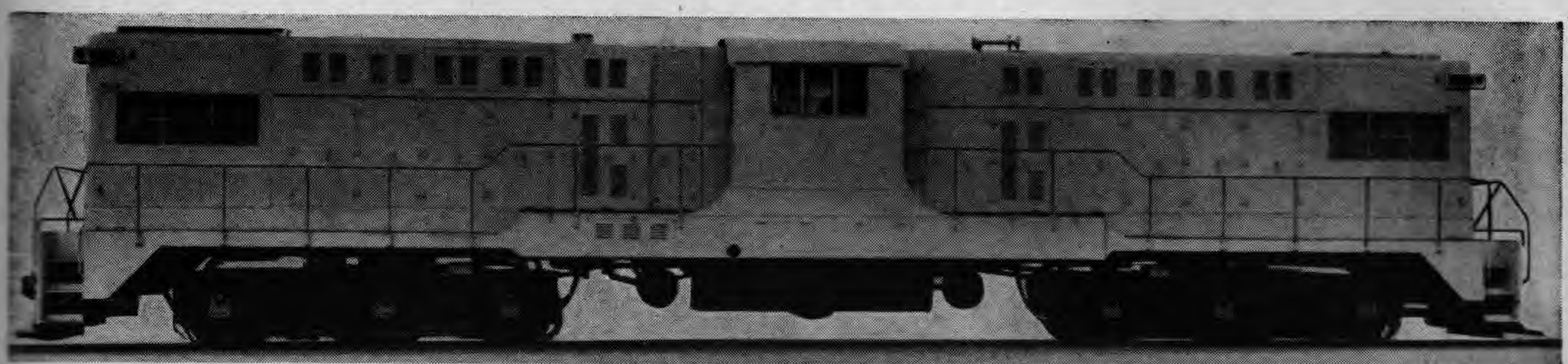
* Modifications



Location of Parts—Baldwin-Westinghouse 1,600-Hp. Road Freight Locomotive—B Unit

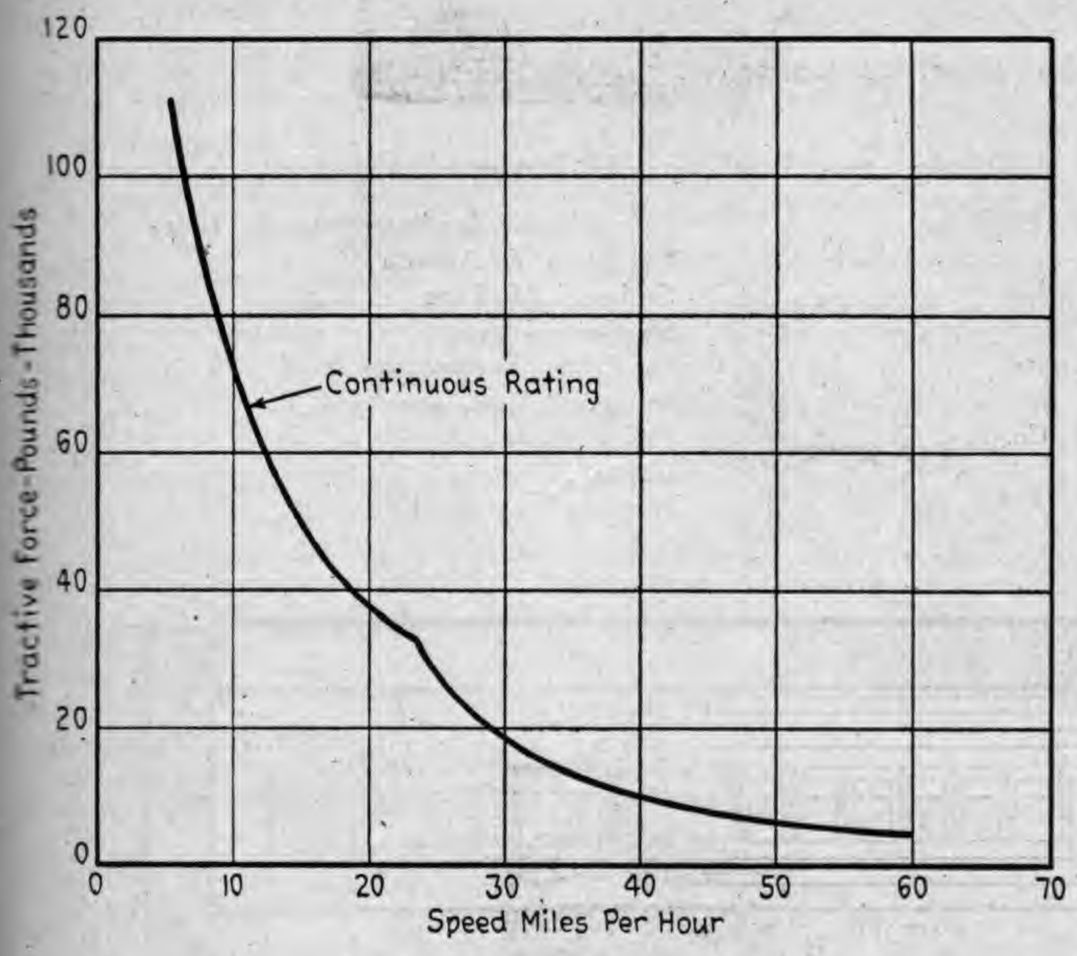
1. Engine
2. Main generator
3. Auxiliary generator & exciter
4. Turbocharger
5. Air intake filter
6. Diesel engine exhaust stack
7. Engine control panel
8. Engine control gauges
9. Lube oil suction strainer
10. Lube oil pump
11. Lube oil filter
12. Lube oil fill
13. Heat exchanger—Lube oil cooler
14. Fuel oil tank
15. Fuel suction strainer
16. Fuel supply pump
17. Fuel pressure filter
18. Radiators—Engine cooling water
19. Radiator Fan with motor
20. Temperature control equipment
21. Expansion tank—Engine cooling water
22. Radiator air discharge
23. Water pump
24. Air compressor
25. Air reservoirs
26. Air brake equipment
27. Hand brake
28. Electrical equipment cabinet
29. Storage battery box
30. Traction motor blower
31. Sand box
32. Operating controls
35. Fire extinguisher (portable)
36. Fire extinguisher (fixed)*
47. Dynamic brake resistors*
48. Dynamic brake equipment*

* Modifications



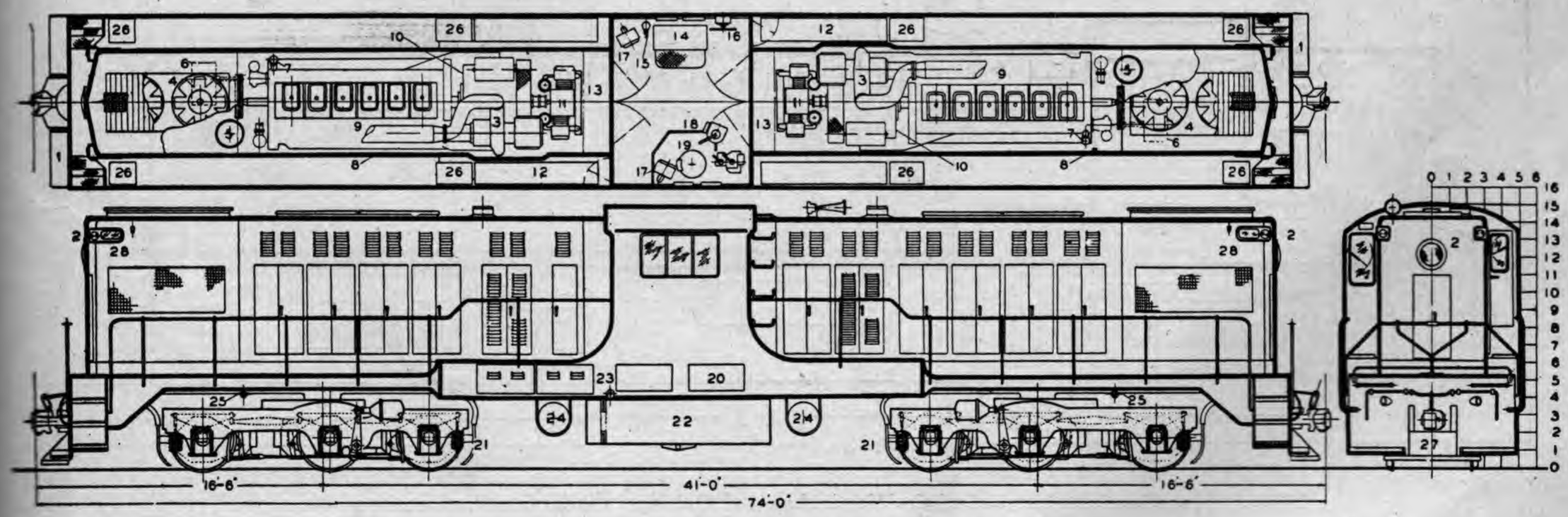
Partial List of Railroads Using Baldwin-Westinghouse 2,000-Hp. and 2,400-Hp. Transfer Locomotives

Atchison, Topeka & Santa Fe
Duluth, South Shore & Atlantic
Elgin, Joliet & Eastern
Minneapolis, Northfield & Southern
Pennsylvania
St. Louis-Southwestern



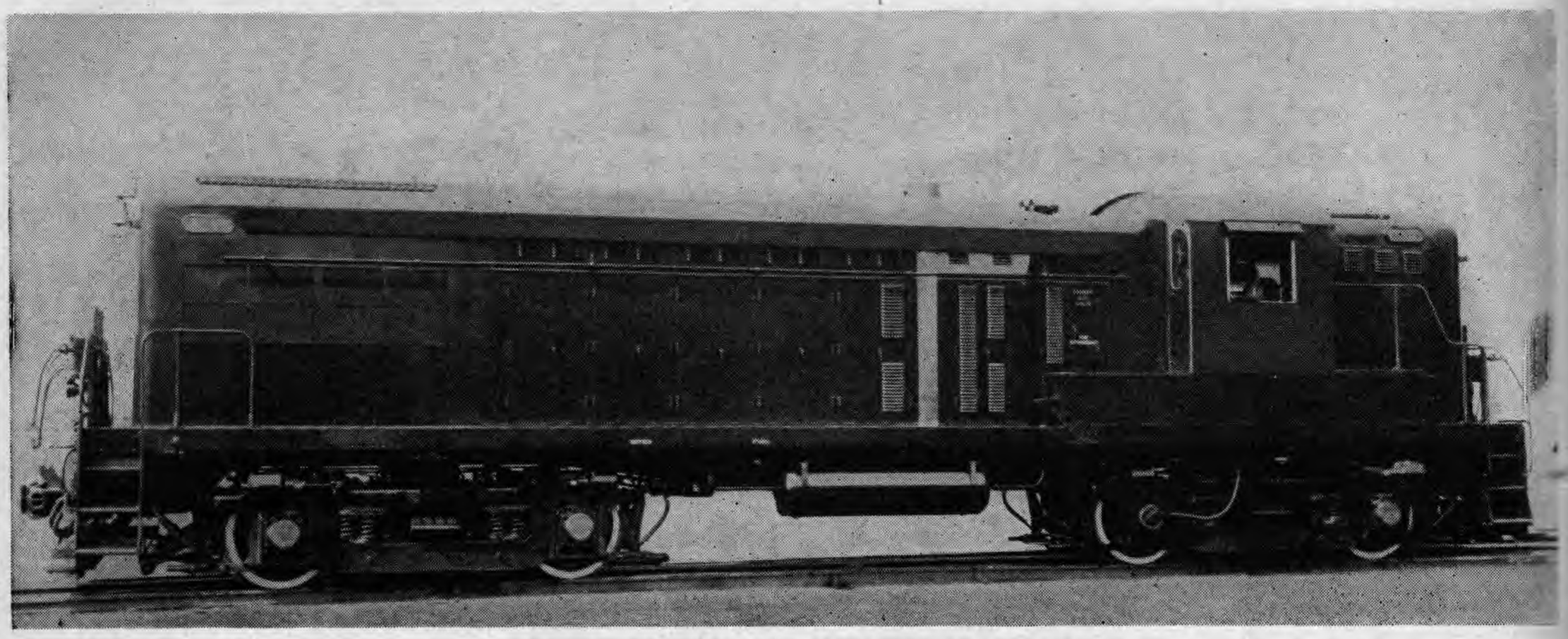
Baldwin-Westinghouse 2,400-Hp. Transfer Locomotive General Characteristics, Weights and Dimensions

Model	RT-624
Type:	
Whyte symbol	0-6-6-0
A.A.R. symbol	C-C
Engines:	
Number per unit	Two
Type	6 cyl., 4-cycle, in line
Cylinders, bore and stroke, in.	12¾ by 15½
Horsepower available for traction, each engine	1,200
Generator:	
Make	Westinghouse
Type	480
Traction motors:	
Number	6
Make	Westinghouse
Type	370
Journal bearings:	
Type	Plain
Size	6½ by 12
Wheels, diameter, in.	42
Wheel base, ft.-in.:	
Truck	13-0
Locomotive	54-9
Distance between truck centers, ft.-in.	41-0
Maximum dimensions, over-all, ft.-in.:	
Width	10-2
Height	15-4¼
Length over coupler pulling faces	74-0
Weights in working order, lb.:	
Locomotive, total, approx.	354,000
On drivers, approx.	354,000
Minimum radius curvature, deg. (with train)	22
Supplies (total capacity):	
Lubricating oil, gal.	340
Fuel oil, gal.	1,500
Engine cooling water, gal.	500
Sand, cu. ft.	45
Air brake schedule	6-SL
Gear ratio	68:15, 63:15
Starting tractive force, lb. (30 per cent adhesion)	106,200
Continuous rating, tractive force, lb.	78,750; 72,900
Maximum speed, m.p.h.	60



Location of Parts—Baldwin-Westinghouse 2,400-Hp. Road Transfer Locomotive

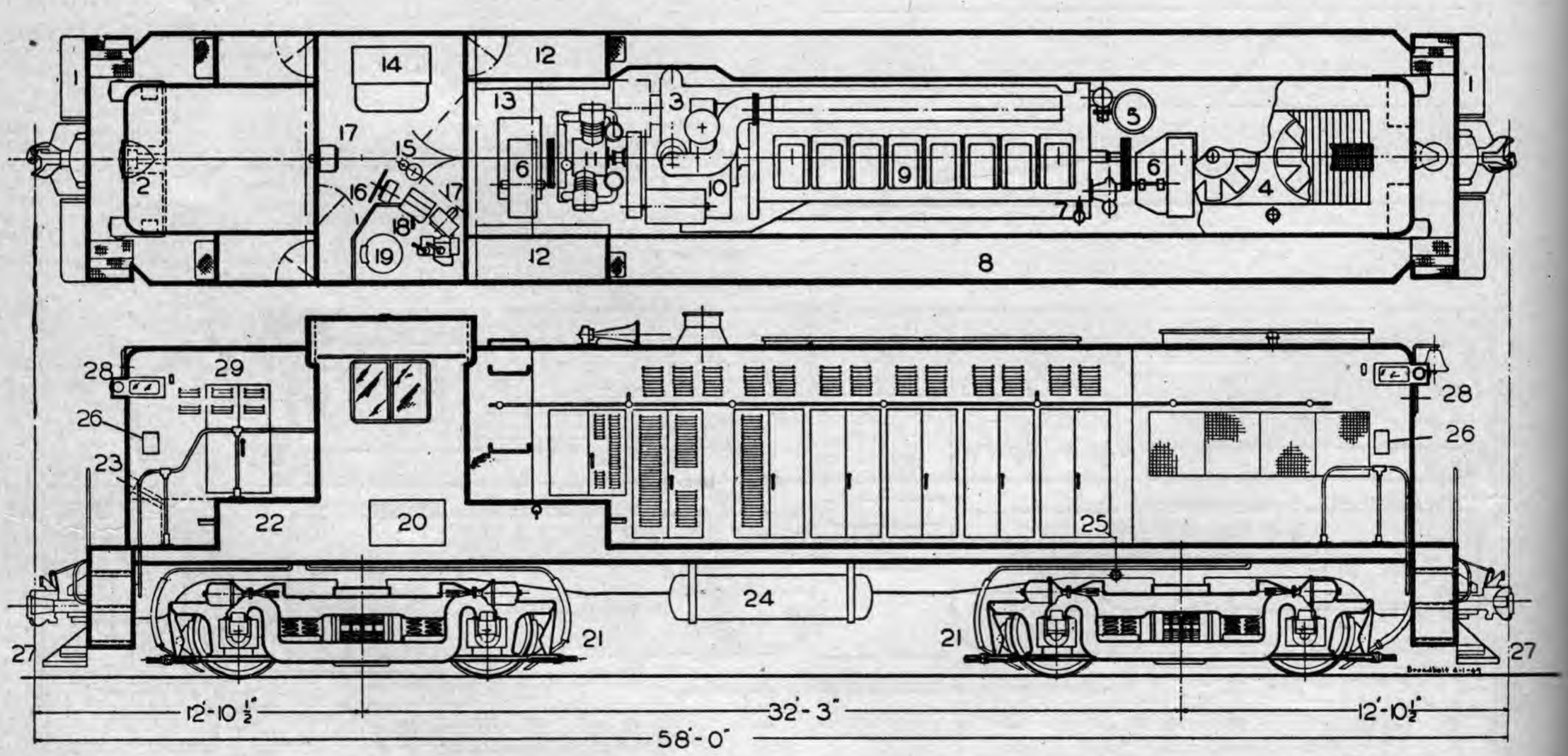
1. Switchmen's steps
2. Headlight
3. Supercharger
4. Cooling system, Radiator cores, Fan & Drive
5. Lube oil filter
6. Traction motor blower
7. Lube oil filler
8. Engine compartment
9. Diesel engine
10. Main Generator
11. Air compressor
12. Storage batteries
13. Electrical equipment cabit
14. Helper's seat
15. Fire extinguisher
16. Hand brake
17. Cab heater
18. Operator's controls
19. Operator's seat
20. Air brake equipment
21. Motor truck
22. Fuel oil tank
23. Fuel oil tank filler
24. Air reservoir
25. Water filler, Diesel engine
26. Sand box filler
27. Pilot
28. Marker & number light



Baldwin-Westinghouse 1,600-hp. all-service locomotive.

Partial List of Railroads Using Baldwin-Westinghouse 1,500-Hp. and 1,600-Hp. All-Service Locomotives

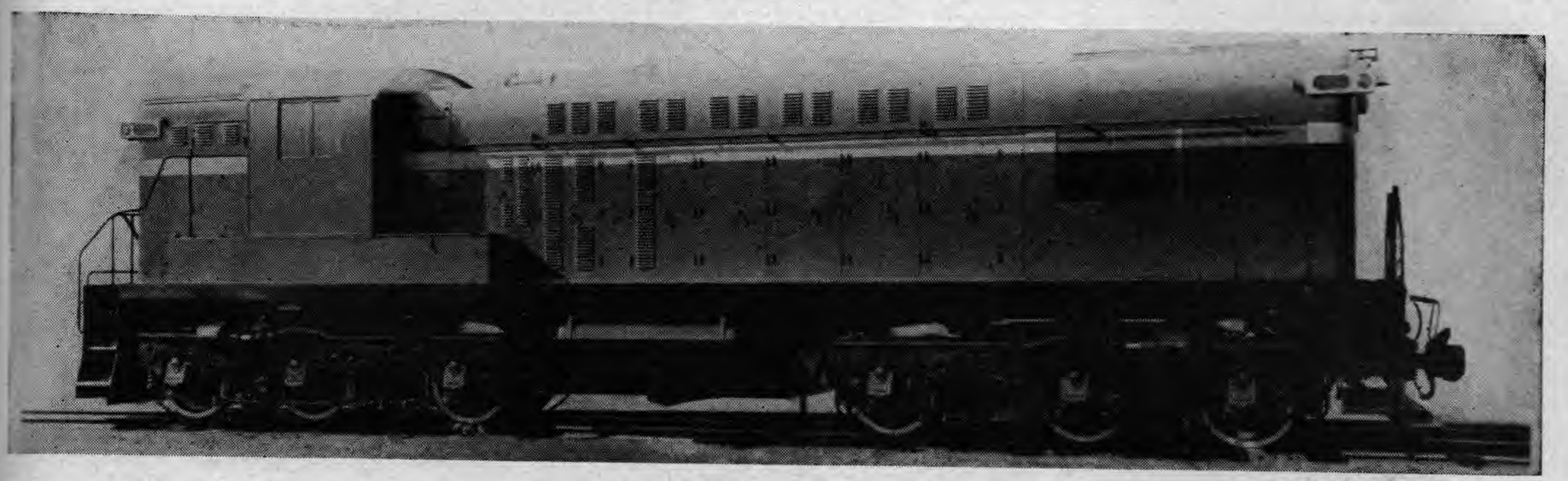
Bessemer & Lake Erie
Central R.R. of N. J.
Chesapeake & Ohio
Chicago & Northwestern
Chicago, Rock Island & Pacific
Columbus & Greenville
Duluth, South Shore & Atlantic
Erie Railroad
Lehigh Valley
McCloud River R.R.
Minneapolis, Northfield & Southern
Minneapolis, St. Paul & Sault Ste. Marie
Missouri-Kansas-Texas
Missouri Pacific
National Railways of Mexico
New York Central
Norfolk-Southern Railway Co.
Northern Pacific
Pennsylvania R.R.
Pennsylvania-Reading Seashore Lines
Savannah & Atlanta
Seaboard Air Line
Southern Pacific
St. Louis, Brownsville & Mexico
Tennessee Coal, Iron & R.R.
Union Pacific
Union
Western Maryland



Location of Parts—Baldwin-Westinghouse 1,600-Hp. All-Service Locomotives

1. Switchmen's steps
2. Headlight
3. Supercharger
4. Cooling system, Radiator cores, Fan & Drive
5. Lube oil filter
6. Traction motor blower
7. Lube oil filler
8. Engine compartment
9. Diesel engine
10. Main generator
11. Air compressor
12. Storage batteries
13. Electrical equipment cabinet
14. Helper's seat
15. Fire extinguisher
16. Hand brake
17. Cab heater
18. Operator's controls
19. Operator's seat
20. Air brake equipment
21. Motor truck
22. Fuel oil tank
23. Fuel oil tank filler
24. Air reservoir
25. Water filler, Diesel engine
26. Sand box filler
27. Pilot
28. Marker & number light
29. Rear compartment

The Baldwin Locomotive Works

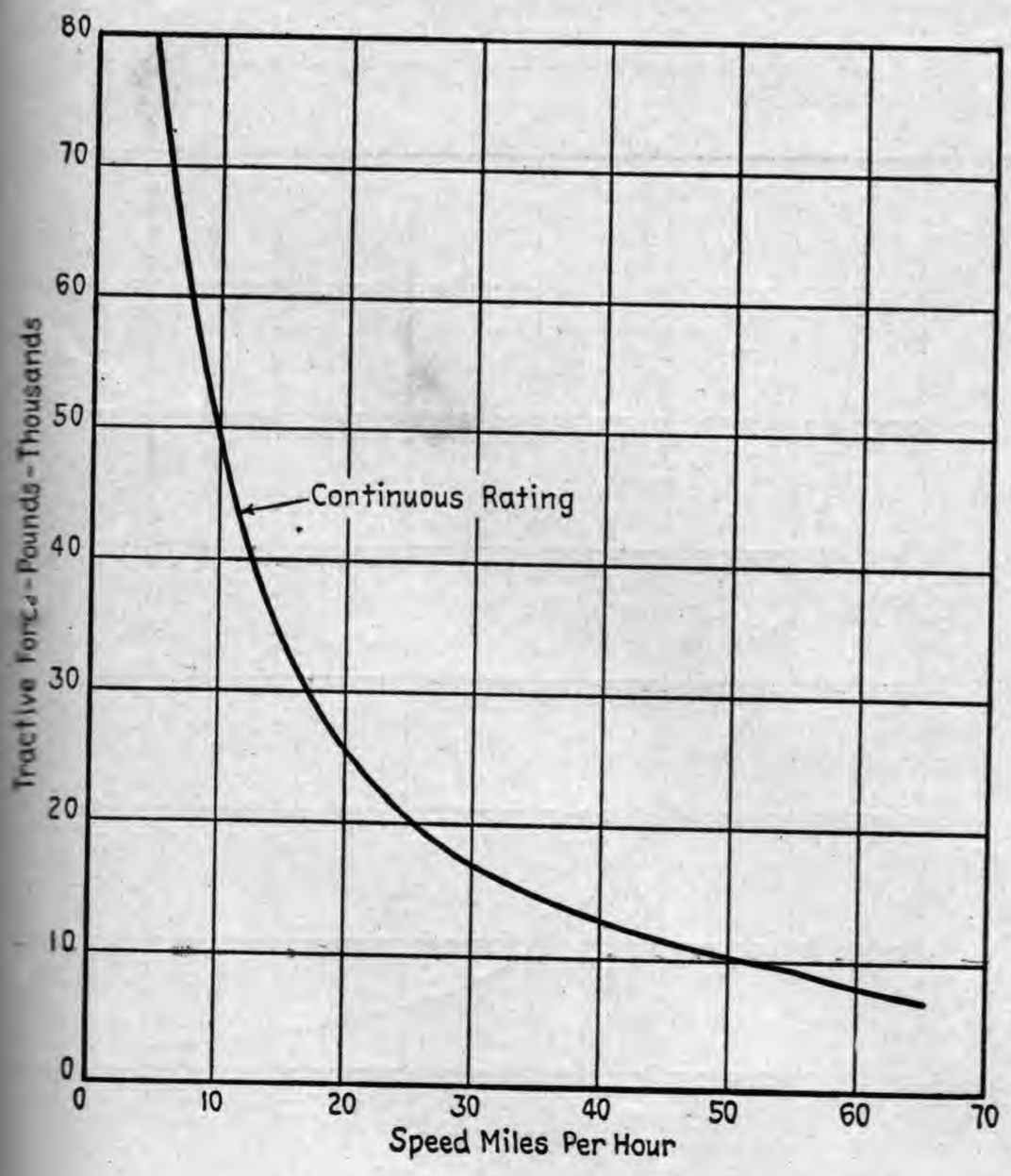


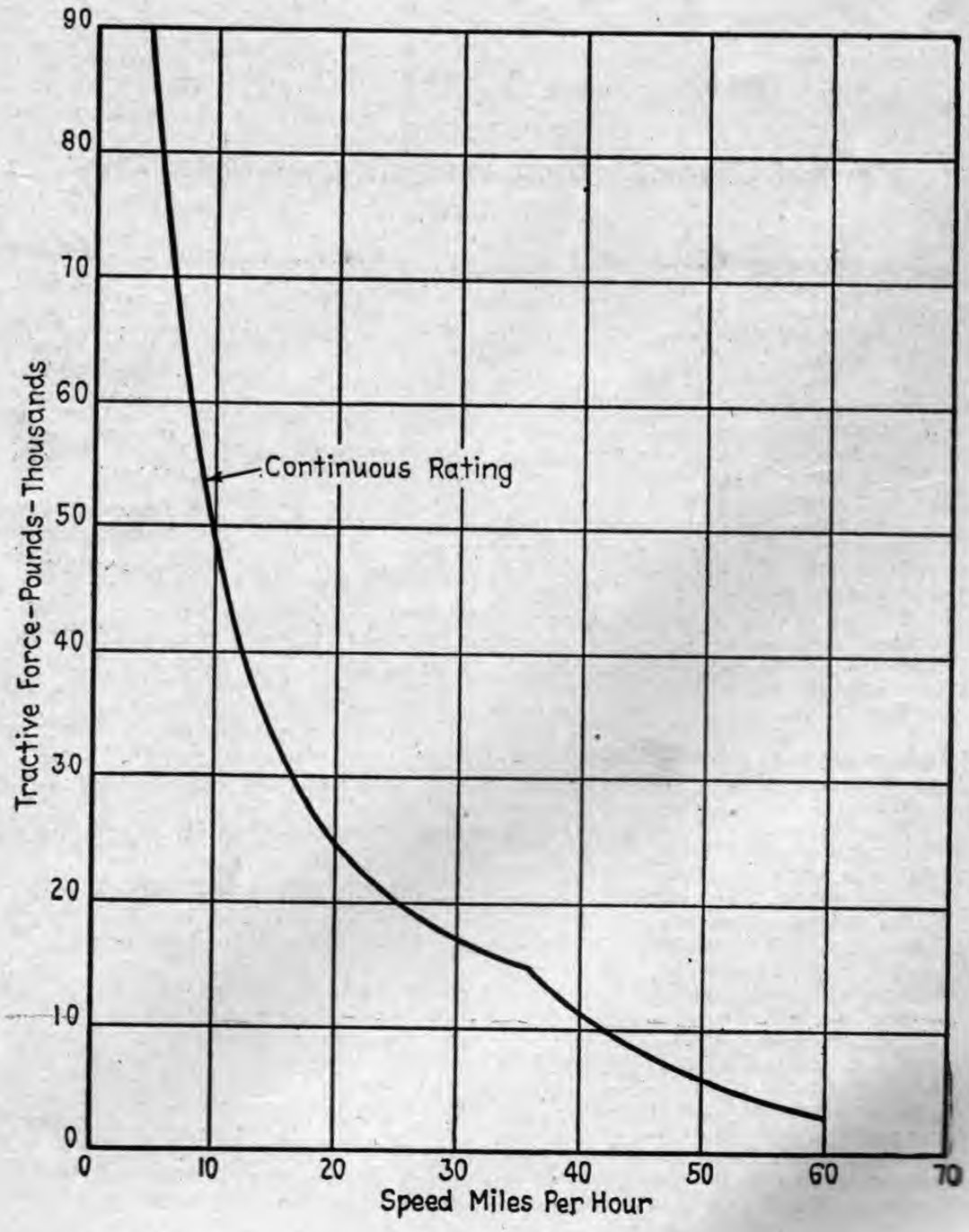
Baldwin-Westinghouse 1,600-Hp. All-Service Locomotives General Characteristics, Weights and Dimensions

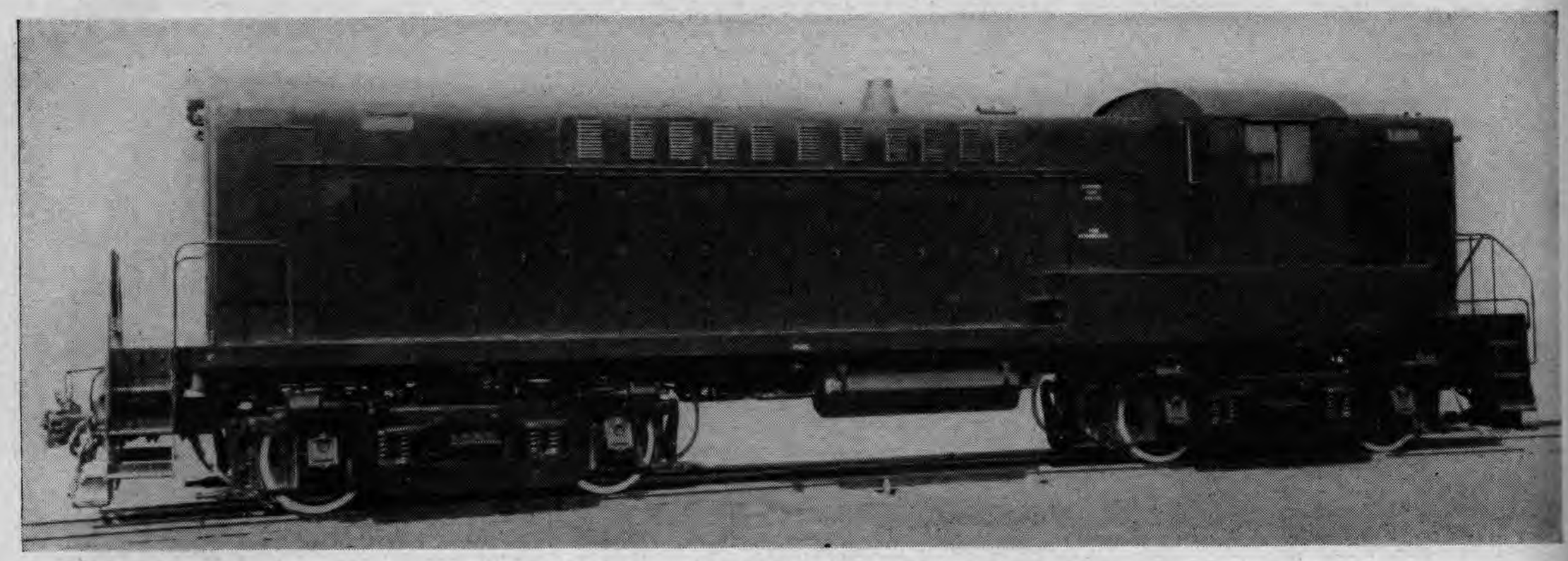
Model	AS-16	AS-416	AS-616
Type:			
Whyte symbol	0-4-4-0	0-6-6-0	0-6-6-0
A.A.R. symbol	B-B	A1A-A1A	C-C
Engines:			
Number per unit	one	one	one
Type	8 cyl., 4 cycle, in line	8 cyl., 4 cycle, in line	8 cyl., 4 cycle, in line
Cylinders, bore and stroke, in.	12½x15½	12½x15½	12½x15½
Horsepower available for traction	1,600	1,600	1,600
Generator:			
Make	West.	West.	West.
Type	471	471	471
Traction motors:			
Number	4	4	4
Make	West.	West.	West.
Type	370	370	370
Journal bearings:			
Type	Plain	Plain	Plain
Size	6½x12½	6½x12	6½x12
Wheels, diameter, in.	42	42	42
Wheel base, ft. in.:			
Truck	9-10	11-6	13-0
Locomotive	42-1	43-9	44-6
Distance between truck centers, ft.-in.	32-3	32-3	32-3

Maximum dimensions, over-all, ft.-in.:			
Width	10-0	10-0	10-2
Height	14-0	14-0	14-1
Length over coupler pulling faces	58-0	58-0	58-0
Weights in working order, lb.:			
Locomotive, total, approx.	236,000	252,000	325,000
On drivers, approx.	236,000	174,000	325,000
Minimum radius curvature, deg. (with train)	30	22	22
Supplies (total capacity):			
Lubricating oil, gal.	200	200	200
Fuel oil, gal.	900	900	1,900
Engine cooling water, gal.	300	300	300
Train heating water, gal. (when furn.)	900	900	900
Sand, cu. ft.	30	30	30
Air brake schedule	6-SL	6-SL	6-SL
Gear ratio	68:15	68:15	68:15
	63:15	63:15	63:15
	62:17	.....	.....
Starting tractive force, lb. (30 per cent adhesion)	70,800	52,200	97,500
Continuous rating, tractive force, lb.	52,500	52,500	78,750
	48,600	48,500	72,900
	42,200	.....	.....
Maximum speed, m.p.h.	65	65	60
	70	65	60
	80	.....	.....

Below left—Tractive force curve for Model AS-16 and AS-416. Right—Curve for AS-616.







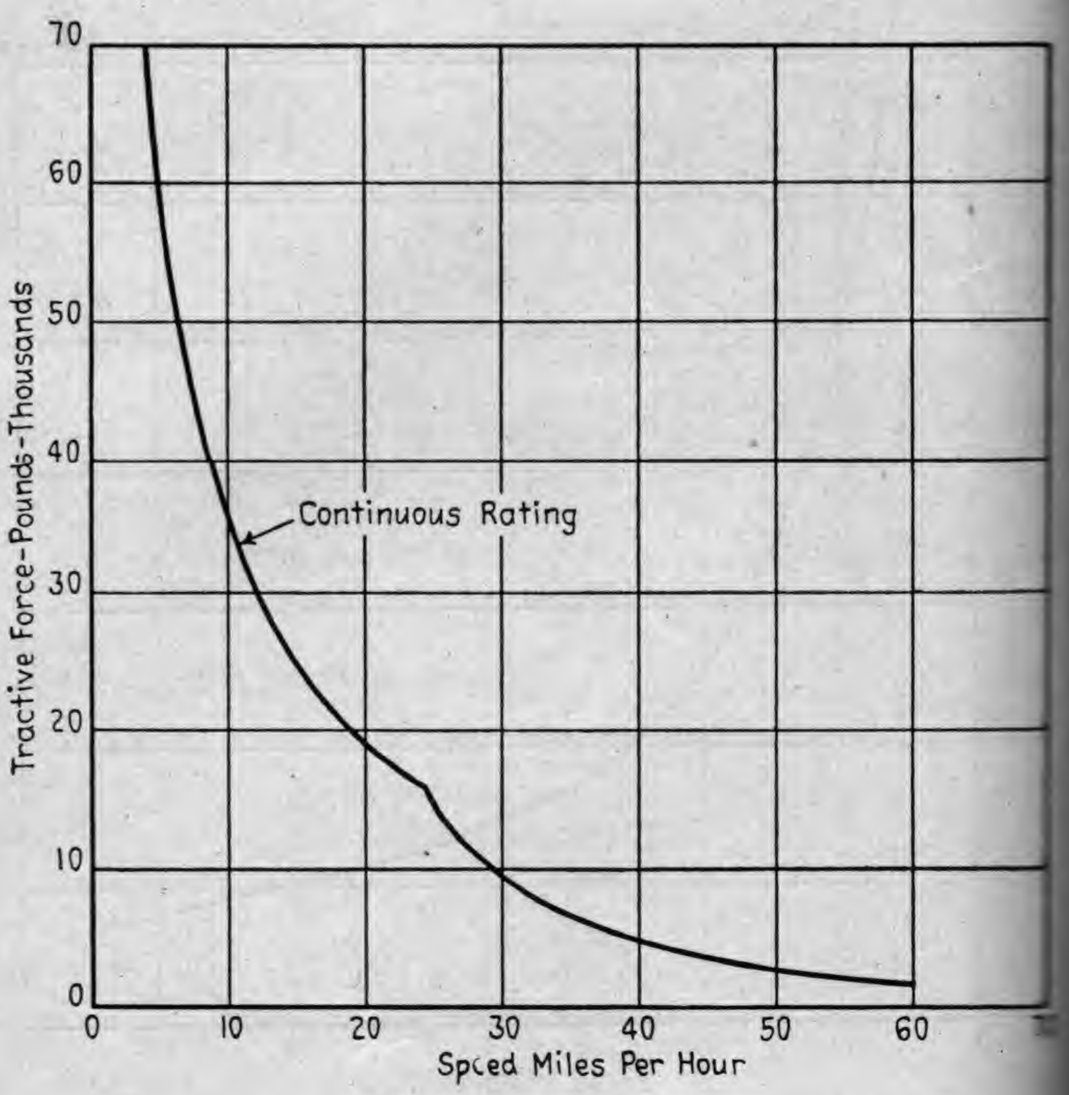
Baldwin-Westinghouse 1,200-hp. road switching locomotive.

Partial List of Railroads Using Baldwin-Westinghouse 1,000-Hp. and 1,20 0-Hp. Switching and Road Switching Locomotives

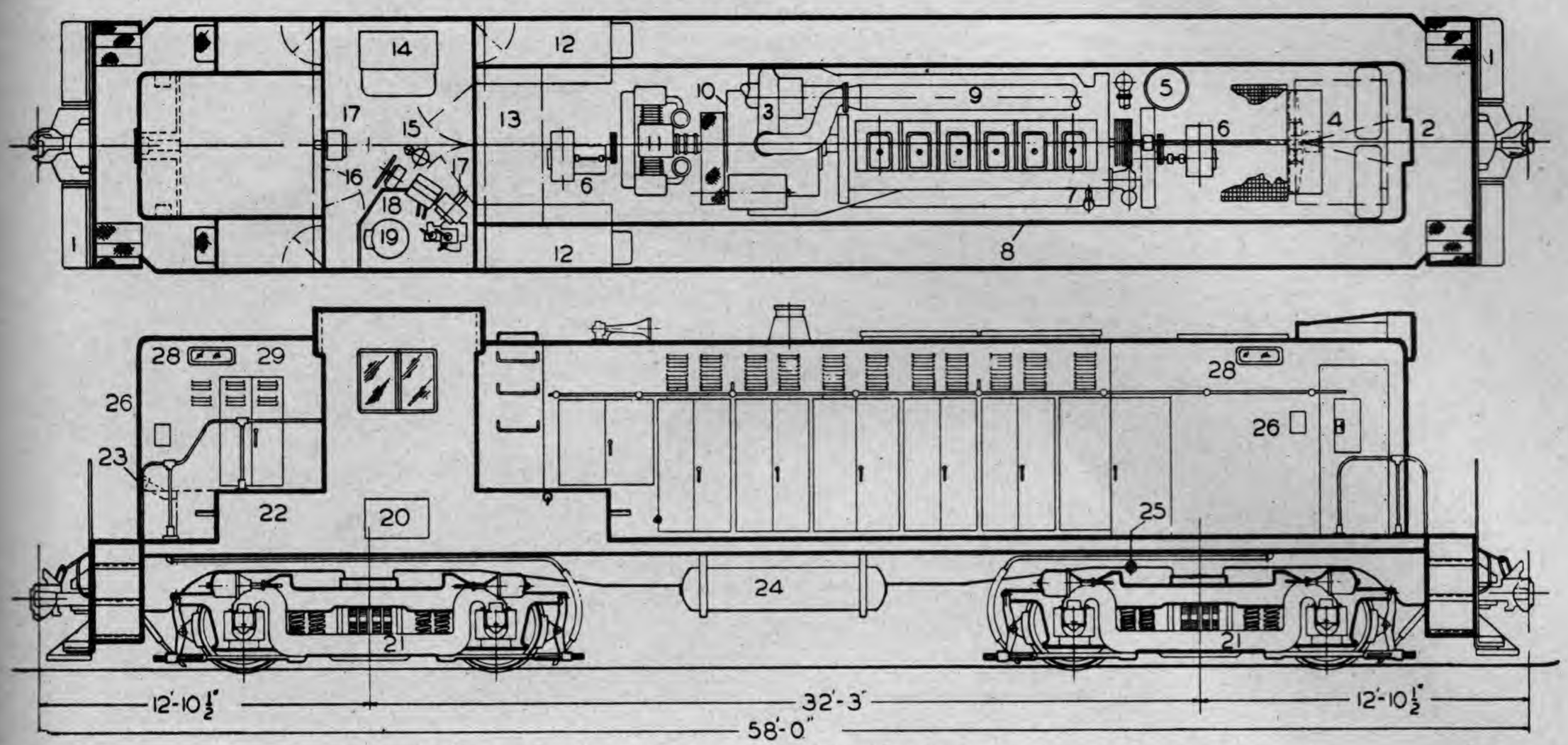
Akron & Barberton Belt
American Smelting & Refining Co.
Atchison, Topeka & Santa Fe
Atlanta & West Point R.R.
Atlantic Coast Line
Baltimore & Ohio
Bessemer & Lake Erie
Canadian Pacific
Canton R.R.
Carnegie Steel
Central of Georgia
Central R.R. of N. J.
Central R.R. of Penna.
Chicago, Burlington & Quincy
Chicago, Rock Island & Pacific
Chicago, Great Western
Chicago & Northwestern
Chicago, St. Paul, Minneapolis & Omaha
Chicago Short Line
Detroit Terminal
Duluth, South Shore & Atlantic
Elgin, Joliet & Eastern
Erie R.R.
Escanaba & Lake Superior R.R.
Geneva Steel Co.
Georgia R.R.
Great Northern
Gulf, Mobile & Ohio
International Great Northern
The Ironton R.R.
Kennecott Copper Corp.
Kentucky & Indiana Terminal
Lehigh Valley
Litchfield & Madison
Long Island
Louisville & Nashville
Macon, Dublin & Savannah
Minneapolis & St. Louis
Minneapolis, Northfield & Southern
Minneapolis, St. Paul & Sault Ste. Marie
Missouri-Kansas-Texas
Missouri Pacific
Nashville, Chattanooga & St. Louis
National Railways of Mexico
New York Central
Nickel Plate
Norfolk-Southern Rwy. Co.
Northern Pacific
Pacific Electric Railway
Patapsco & Back Rivers
Pennsylvania R.R.
Phelps Dodge Corp.
Pittsburgh & West Virginia
Reading Company
Seaboard Air Line
Southern Pacific
Southern
Spokane, Portland & Seattle
St. Louis, Brownsville & Mexico
St. Louis-San Francisco
Tennessee Eastman Corp.
Tennessee Coal Iron & R.R.
Tennessee Central
Terminal R.R. of St. Louis
Union Pacific
Union
U. S. Navy
U. S. War Department
U. S. Army
Wabash
Western Alabama
Western Maryland
Western Pacific

Baldwin-Westinghouse 1,200-Hp. Road Switching Locomotive
General Characteristics, Weights and Dimensions 2

Model	RS-1
Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	6 cyl., 4-cycle, in line
Cylinders, bore and stroke, in.	12¾ by 15½
Horsepower available for traction	1,200
Generator:	
Make	Westinghouse
Type	480
Traction motors:	
Number	4
Make	Westinghouse
Type	362
Journal bearings:	
Type	Plain
Size	6½ by 12
Wheels, diameter, in.	42
Wheel base, ft.-in.:	
Truck	9-10
Locomotive	42-1
Distance between truck centers, ft.-in.	32-3
Maximum dimensions, over-all, ft.-in.:	
Width	10-0
Height	14-0
Length over coupler pulling faces	58-0
Weights in working order, lb.:	
Locomotive, total, approx.	224,000
On drivers, approx.	224,000
Minimum radius curvature, deg. (with train)	30
Supplies (total capacity):	
Lubricating oil, gal.	170
Fuel oil, gal.	900
Engine cooling water, gal.	250
Train heating water, gal. (when furnished)	900
Sand, cu. ft.	30
Air brake schedule	6-SL
Gear ratio	68:14
Starting tractive force, lb. (30 per cent adhesion)	67,200
Continuous rating, tractive force, lb.	32,400
Maximum speed, m.p.h.	60

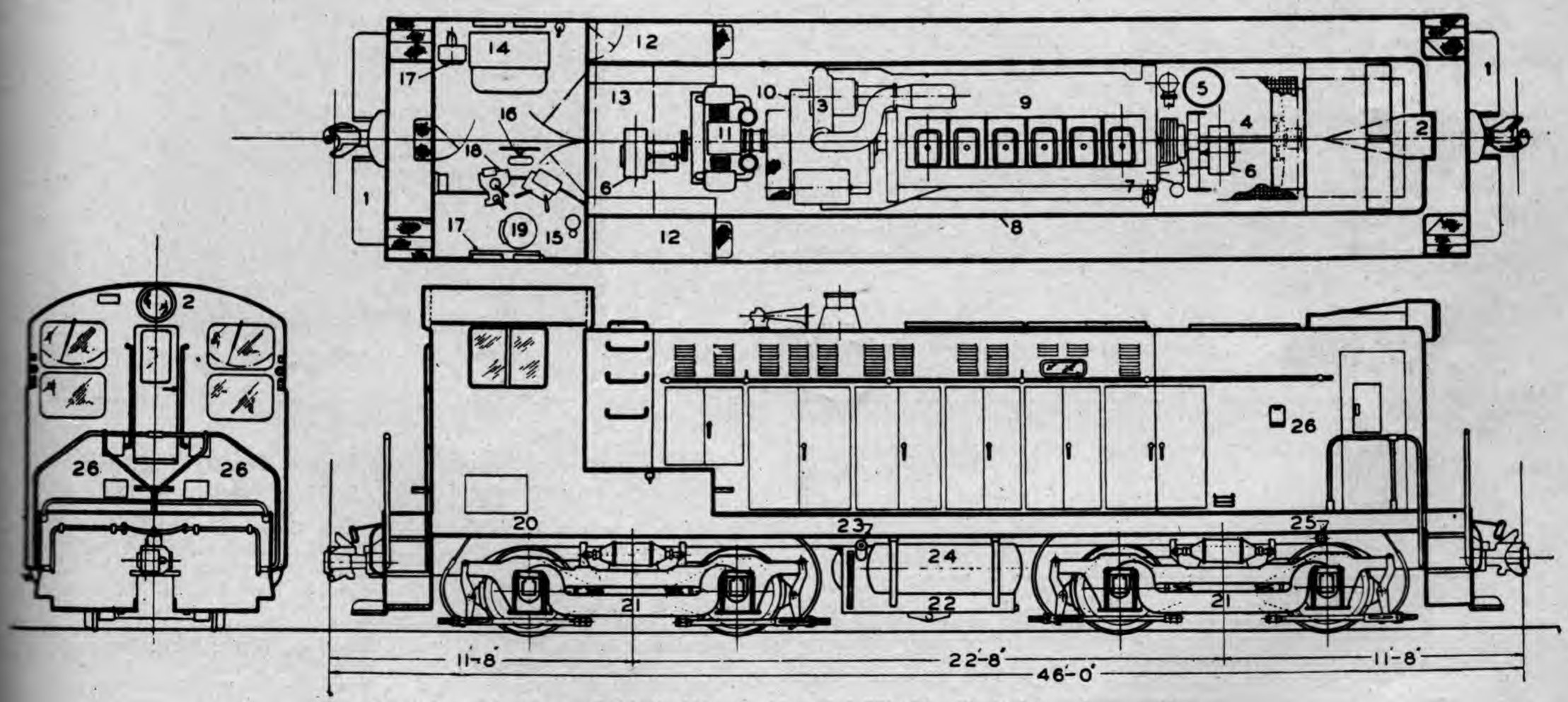


The Baldwin Locomotive Works



Location of Parts—Baldwin-Westinghouse 1,200-Hp. Road Switching Locomotive

1. Switchmen's steps
2. Headlight
3. Supercharger
4. Cooling system, Radiator cores, Fan & Drive
5. Lube oil filter
6. Traction motor blower
7. Lube oil filler
8. Engine compartment
9. Diesel engine
10. Main generator
11. Air compressor
12. Storage batteries
13. Electrical equipment cabinet
14. Helper's seat
15. Fire extinguisher
16. Hand brake
17. Cab heater
18. Operator's controls
19. Operator's seat
20. Air brake equipment
21. Motor truck
22. Fuel oil tank
23. Fuel oil tank filler
24. Air reservoir
25. Water filler, Diesel engine
26. Sand box filler
27. Pilot
28. Number light
29. Rear compartment



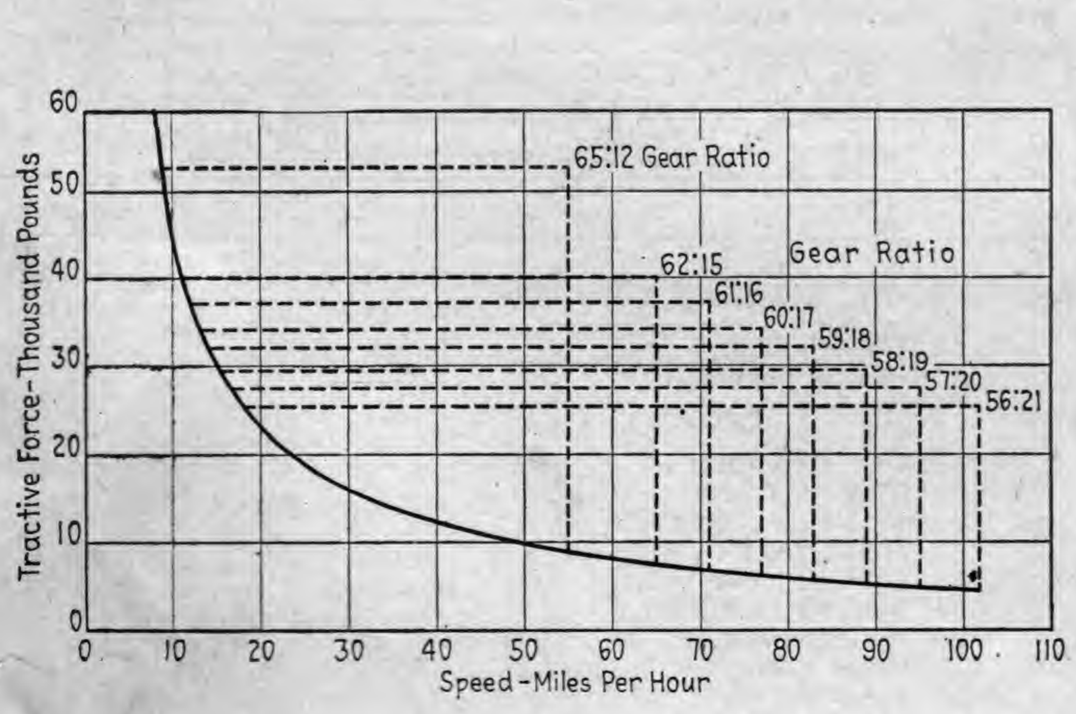
Location of Parts—Baldwin-Westinghouse 1,200-Hp. Switching Locomotive

1. Switchmen's steps
2. Headlight
3. Supercharger
4. Cooling system, Radiator cores, Fan and Drive
5. Lube oil filter
6. Traction motor blower
7. Lube oil filler
8. Engine compartment
9. Diesel engine
10. Main generator
11. Air compressor
12. Storage batteries
13. Electrical equipment cabinet
14. Helper's seat
15. Fire extinguisher
16. Hand brake
17. Cab heater
18. Operator's controls
19. Operator's seat
20. Air brake equipment
21. Motor truck
22. Fuel oil tank
23. Fuel oil tank filler
24. Air reservoir
25. Water filler, Diesel engine
26. Sand box filler

General Motors 1,500-Hp. F7 Freight Locomotive

General Characteristics, Weights and Dimensions

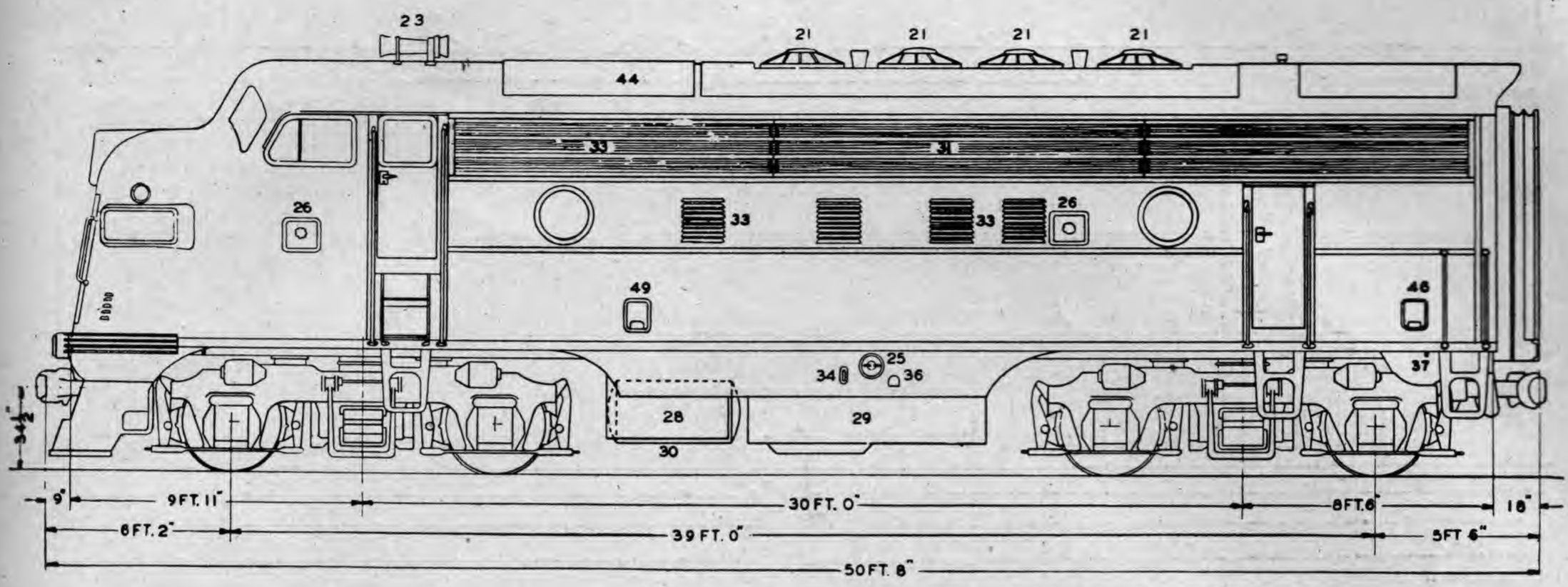
Model	F7
Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	16 cyl., 2 cycle, vee
Model	567B
Cylinders, bore and stroke, in.	8½ by 10
Horsepower	1,500
Traction motors, number	4
Journal bearings:	
Type	Roller
Size	6½ by 12
Wheels, diameter, in.	40
Wheel base, ft.-in.:	
Truck	9-0
Locomotive	39-0
Distance between truck centers, ft.-in.	30-0
Maximum dimensions, over-all, ft.-in.:	
Width	10-8
Height	15-0
Length over coupler pulling faces	50-8
Weights in working order, lb.:	
Locomotive, total, approx.	230,000
On drivers, approx.	230,000
Truck, each	37,800
Minimum radius curvature, deg.	23
Supplies (total capacity):	
Lubricating oil, gal.	200
Fuel oil, gal.	1,200
Engine cooling water, gal.	230
Sand, cu. ft.	16
Air brake schedule	24-RL
Gear ratio	65:12, 62:15, 61:16, 60:17, 59:18, 58:19, 57:20, 56:21
Continuous rating, tractive force, lb.	52,400, 40,000, 37,000, 34,000, 32,000, 29,500, 27,500, 25,500
Maximum speed, m.p.h.	55, 65, 71, 77, 83, 89, 95, 102

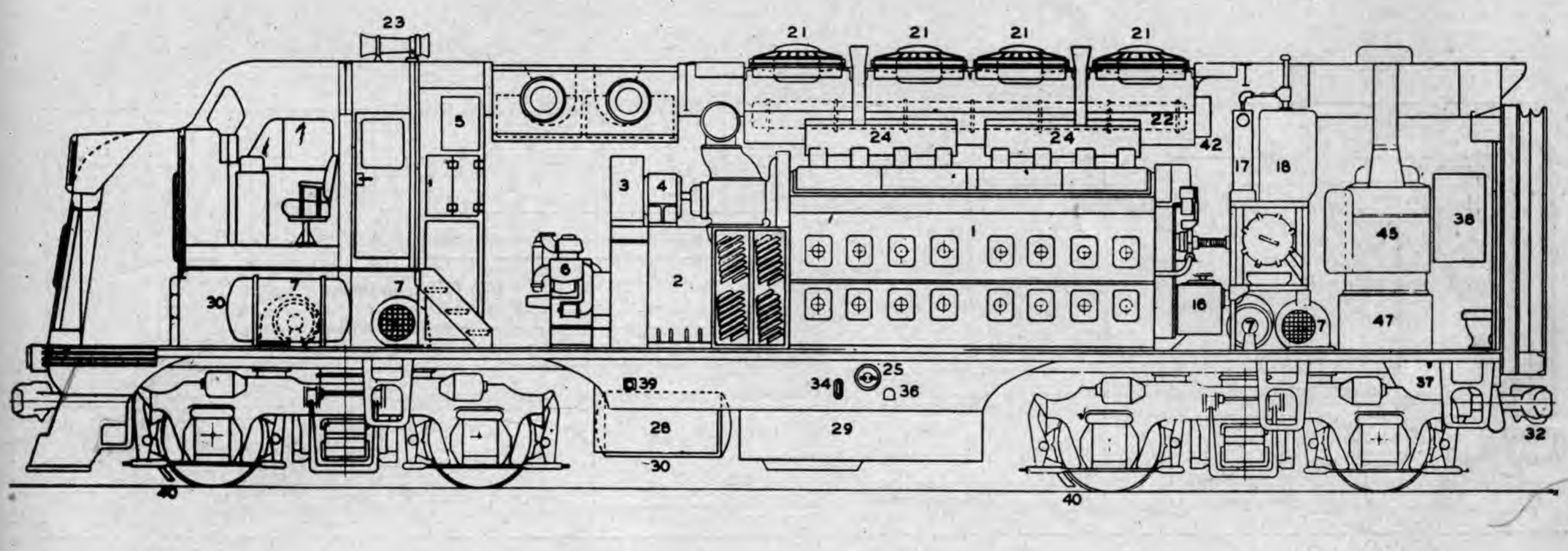


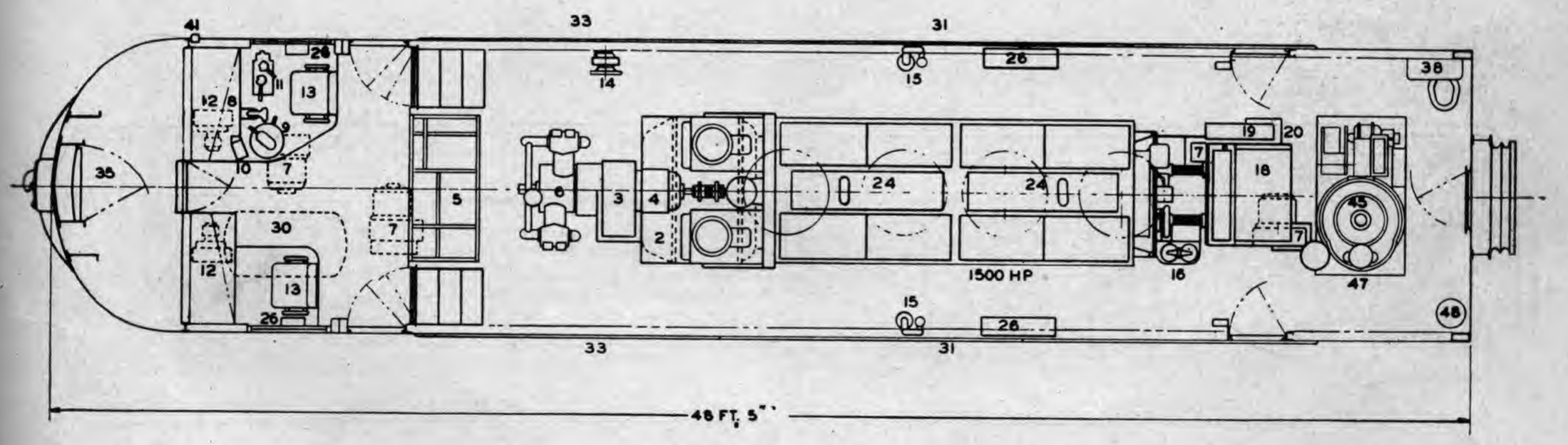
Partial List of Railroads Using General Motors 1,500-Hp. Freight Locomotives (F3 & F7) As of March 31, 1950

Atchison, Topeka & Santa Fe
Atlantic Coast Line
Baltimore & Ohio
Bangor & Aroostook
Boston & Maine
Canadian National
Central of Georgia
Chicago & Eastern Illinois
Chicago & North Western
Chicago, Burlington & Quincy
Chicago Great Western
Chicago, Ind. & Louisville
Chicago, Milw. St. P. & P.
Chicago, Rock Island & Pacific
Clinchfield
Delaware, Lackawanna & Western
Denver & Rio Grande Western
Erie
Florida East Coast
Georgia Railroad
Grand Trunk Western
Great Northern
Kansas City Southern
Lehigh Valley
Louisville & Nashville
Maine Central
Mexican Government Ry.
Minneapolis & St. Louis
Mpls. St. Paul & S. St. Marie
Missouri-Kansas-Texas
Missouri Pacific
Nashville, Chatt. & St. Louis
New York Central
New York Ontario & Western
Northern Pacific
Pennsylvania
Reading
Richmond, Fred. & Potomac
St. Louis-San Francisco
St. Louis-Southwestern
Seaboard Air Line
Southern
Southern Pacific
Spokane, Portland & Seattle
Texas & Pacific
Toledo, Peoria & Western
Union Pacific
Wabash
Western Maryland
Western Pacific
Western Railway of Alabama

Electro-Motive Division—General Motors Corporation





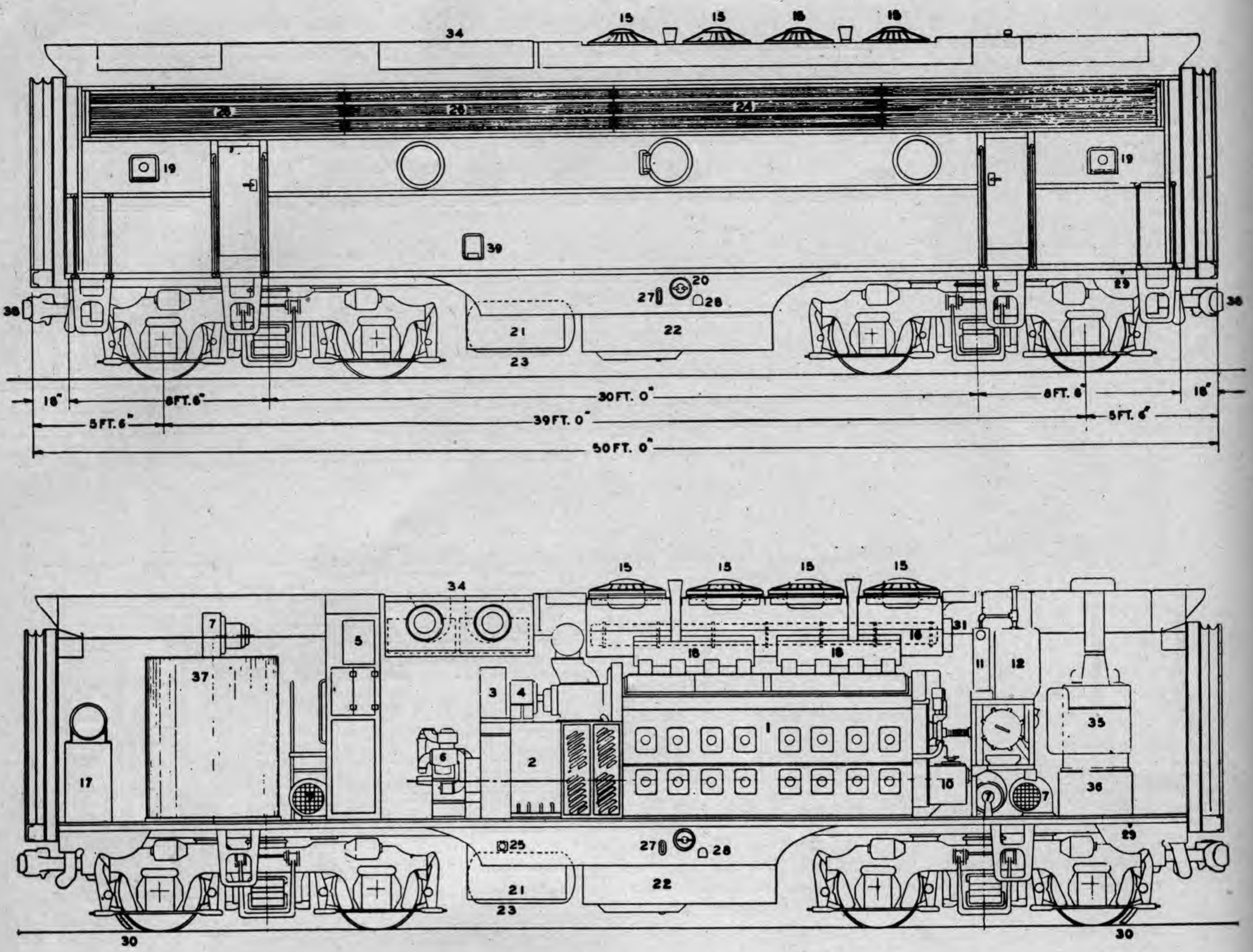


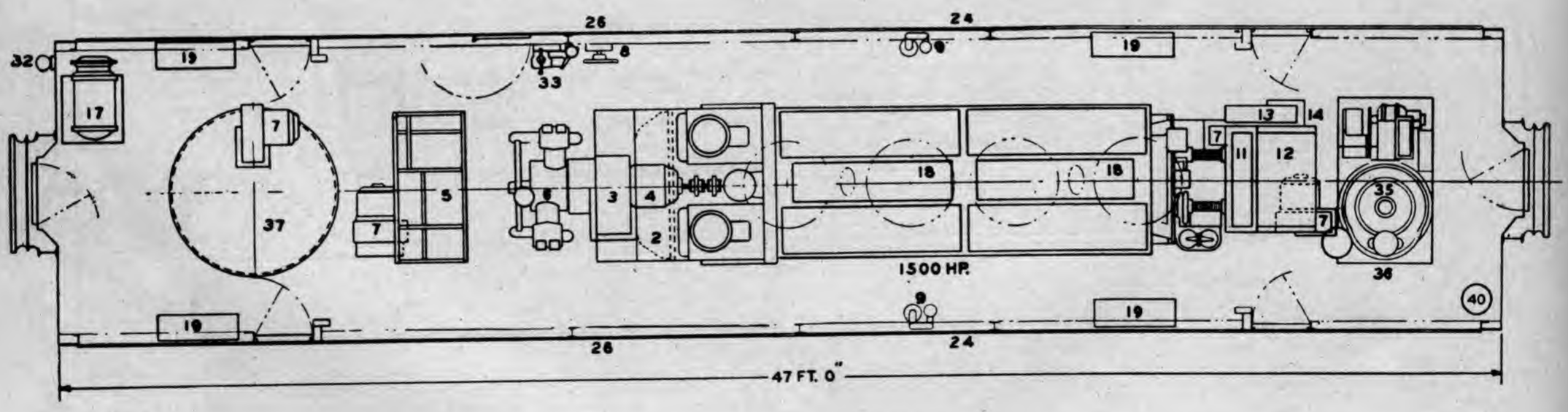
Location of Parts—General Motors 1,500-Hp. F7 Freight Locomotive, A Uuit

1. Engine E.M.D. Model 16-567-B
2. Main generator and alternator
3. Generator blower
4. Aux. generator
5. Control cabinet
6. Air compressor
7. Traction motor blower
8. Instrument board
9. Control stand
10. Speedometer recorder
11. Air brake valve
12. Cab heater
13. Seat
14. Hand brake
15. Fuel tank vent with flame arrestor
16. Lub. oil filler
17. Lub. oil cooler
18. Engine water tank
19. Engine control & instrument panel
20. Load regulator
21. 34 in. fan and motor
22. Radiator
23. Horn
24. Exhaust manifold
25. Fuel filler
26. Sand box
27. Head light—fixed beam
28. Batteries
29. Fuel tank—1,200 gal.
30. Main air reservoir
31. Air intake and shutters
32. Coupler between units
33. Air intake for grids & engine room
34. Fuel tank gauge
35. Door—plain
36. Emergency fuel cut-off
37. Engine water filler (both sides)
38. Toilet
39. Battery charging receptacle (left side only)
40. Sanding nozzles
41. Blue flag bracket
42. A.C. contactor cabinet
43. Number box
44. Boiler
45. Boiler water tank—820 gal.
46. Boiler water tank—330 gal.
47. Boiler water tank—600 gal.
48. Boiler water softener
49. Boiler water filler—both sides
50. Dynamic brake grids & Blowers*

* Modifications

Electro-Motive Division—General Motors Corporation





Location of Parts—General Motors 1,500-Hp. F7 Freight Locomotive, B Unit

1. Engine E.M.D. Model 16-567-B
2. Main generator and alternator
3. Generator blower
4. Aux. generator
5. Control cabinet
6. Air compressor
7. Traction motor blower
8. Hand brake
9. Fuel tank vent with flame arrestor
10. Lub. oil filler
11. Lub. oil cooler
12. Engine water tank
13. Engine control & instrument panel
14. Load regulator
15. 34-in. fan & motor
16. Radiator
17. Air brake equipment
18. Exhaust manifold
19. Sand box
20. Fuel filler
21. Batteries
22. Fuel tank—1,200 gal.
23. Main air reservoir
24. Air intake & shutters
25. Battery charging receptacle (left side only)
26. Air intake for grid & Engine Room
27. Fuel tank gauge
28. Emergency fuel cut-off
29. Engine water filler (both sides)
30. Sanding nozzles
31. A.C. contactor nozzles
32. Horn*
33. Hostler control*
34. Dynamic brake grids & blowers*
35. Boiler*
36. Boiler water tank—200 gal.*
37. Boiler water tank—1,200 gal.*
38. Couplers between units*
39. Boiler water tank filler (1,200 gal.)*
40. Boiler water softener*

* Modifications

Electro-Motive Division—General Motors Corporation

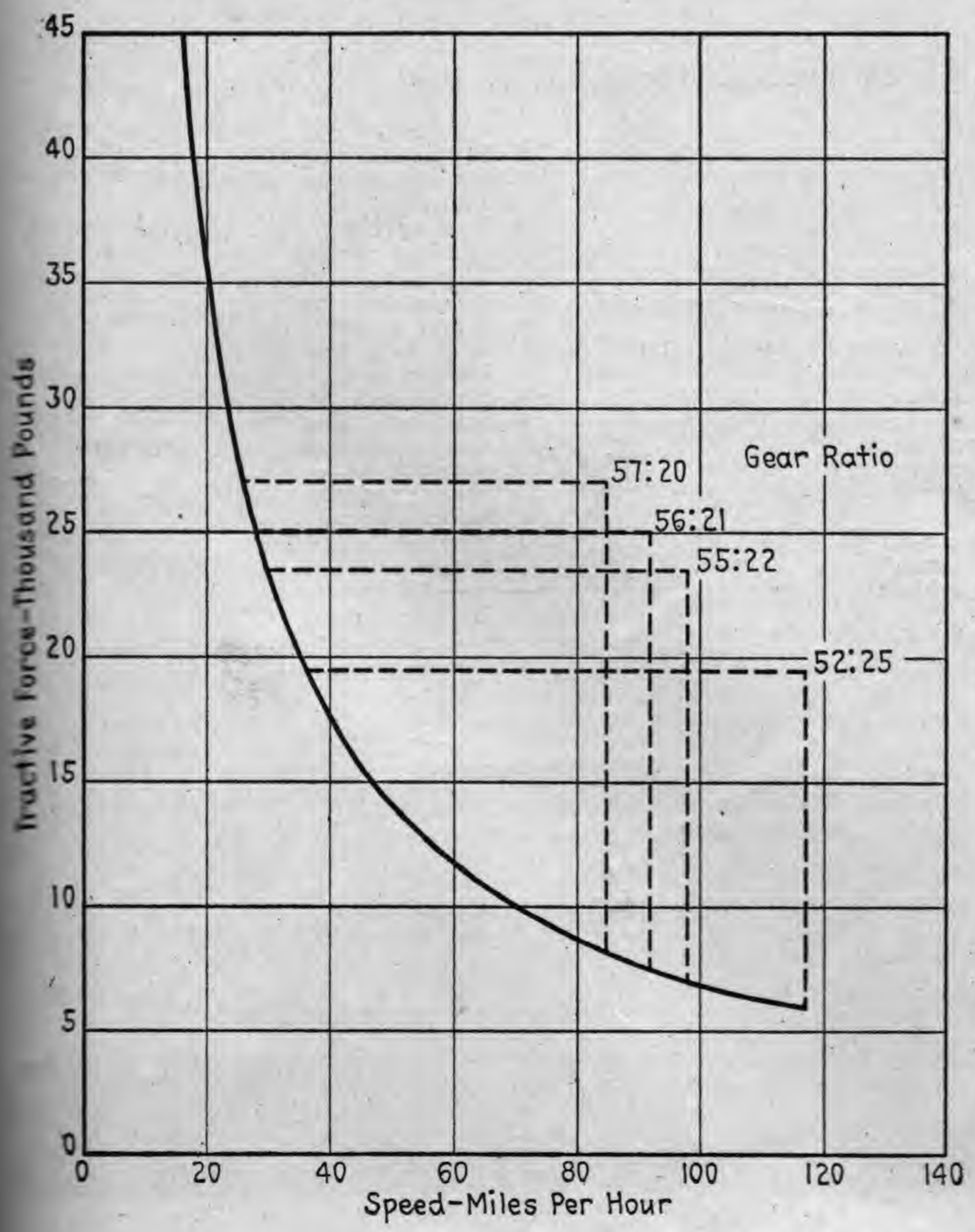
Partial List of Railroads Using General Motors Passenger Locomotives (E7 and E8) As of March 31, 1950
(E8 shown above)

E7

Atchison, Topeka & Santa Fe
Atlantic Coast Line
Baltimore & Ohio
Bangor & Aroostook
Boston & Maine
Central of Georgia
Chesapeake & Ohio (P.M.)
Chicago & Eastern Illinois
Chicago & North Western
Chicago, Burlington & Quincy
Chicago, Milw. St. P. & P.
Chicago, Rock Island & Pacific
Florida East Coast
Great Northern
Gulf, Mobile & Ohio
Illinois Central
Kansas City Southern
Louisville & Nashville
Maine Central
Missouri-Kansas-Texas
Missouri Pacific
New York Central
Pennsylvania
St. Louis-San Francisco
Seaboard Air Line
Southern
Southern Pacific
Spokane, Portland & Seattle
Taxas & Pacific
Union Pacific
Wabash

E8

Atlantic Coast Line
Boston & Maine
Canadian Pacific
Chicago, Burlington & Quincy
Missouri-Kansas-Texas
Pennsylvania
Richmond, Fred. & Potomac
St. Louis-San Francisco
Southern Pacific
Wabash



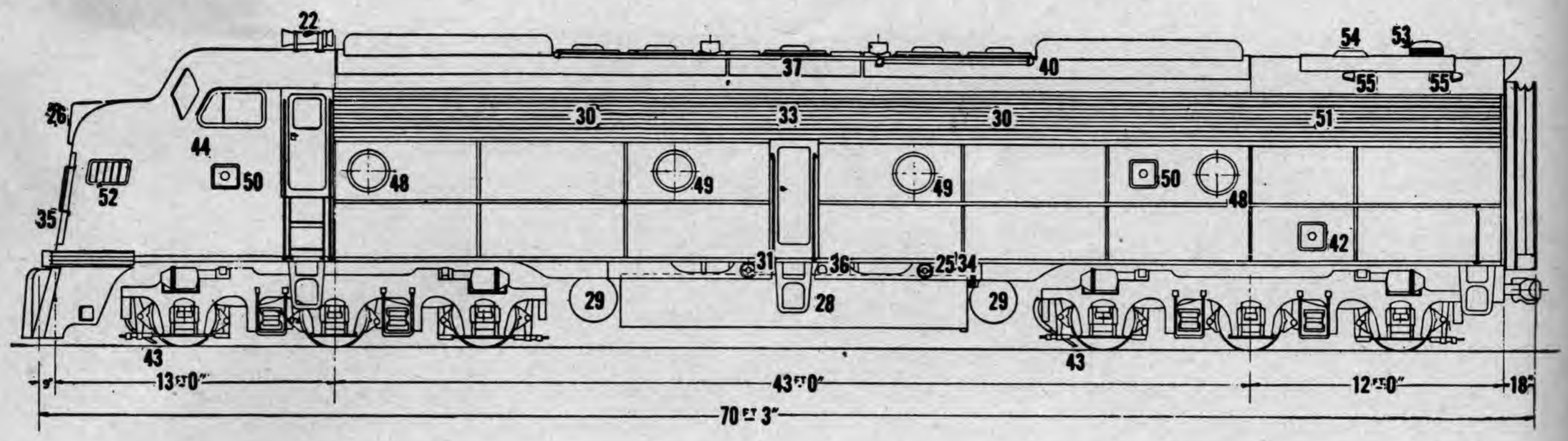
General Motors 2,250-Hp., E8 Passenger Locomotive, General Characteristics, Weights and Dimensions

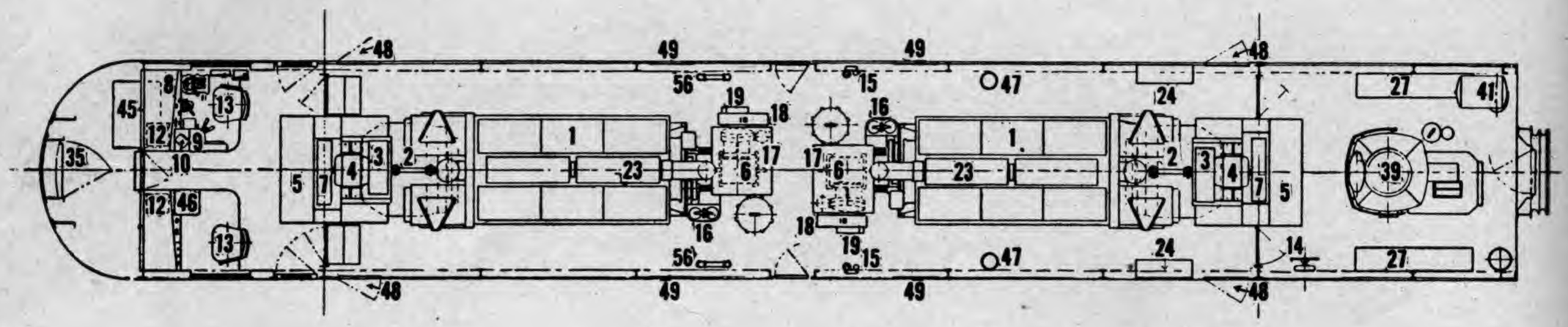
Model	E8
Type:	
Whyte symbol	0-6-6-0
A.A.R. symbol	A1A-A1A
Engines:	
Number per unit	2
Type	12 cyl., 2 cycle, vee
Model	567B
Cylinders, bore and stroke, in.	8½ by 10
Horsepower, each engine	1,125
Traction motors, number	4
Journal bearings:	
Type	Roller
Size	6½ by 12
Wheels, diameter, in.	36
Wheel base, ft.-in.:	
Truck	14-1
Locomotive	57-0
Distance between truck centers, ft.-in.	43-1

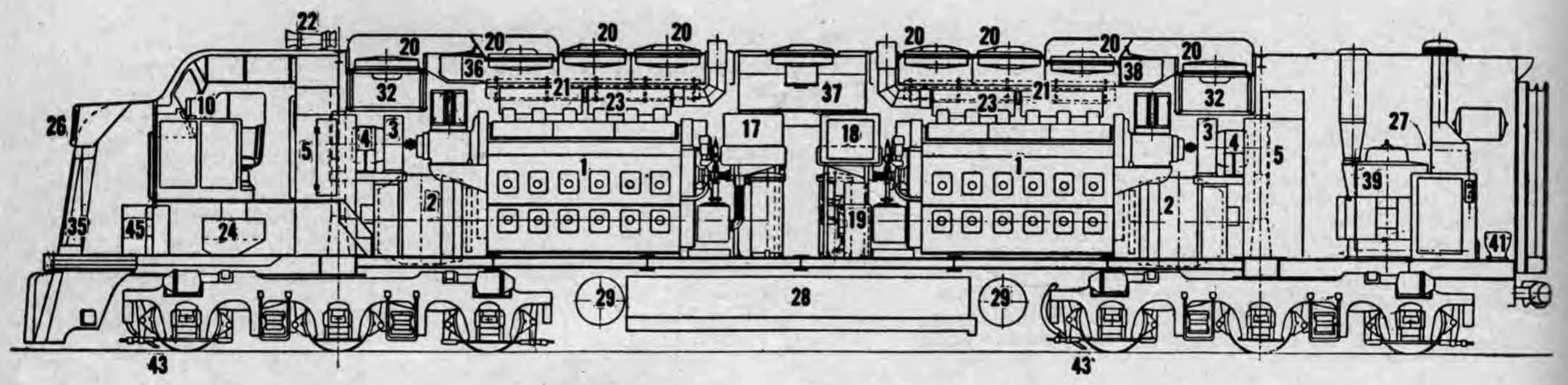
Maximum dimensions, over-all, ft.-in.:	A Unit	B Unit
Width	10-8	10-8
Height	14-10½	14-7½
Length over coupler pulling faces	70-3	70-0
Weights in working order, lb.:		
Locomotive, total approx.	316,500	308,300
On drivers, approx.	210,750	207,500
Trucks, each	51,450	51,450
Maximum radius curvature, deg.	21	21
Supplies (total capacity):		
Lubricating oil, gal.	330	330
Fuel oil, gal.	1,200	1,200
Engine cooling water, gal.	400	400
Train heating water, gal.	1,350	1,350
Sand, cu. ft.	16	none

Air brake schedule	24-RL
Gear ratio	52:25, 55:22, 56:21, 57:20
Continuous rating, tractive force, lb.	19,500, 23,500, 25,000, 27,000
Maximum speed, m.p.h.	117, 98, 92, 85

Electro-Motive Division—General Motors Corporation





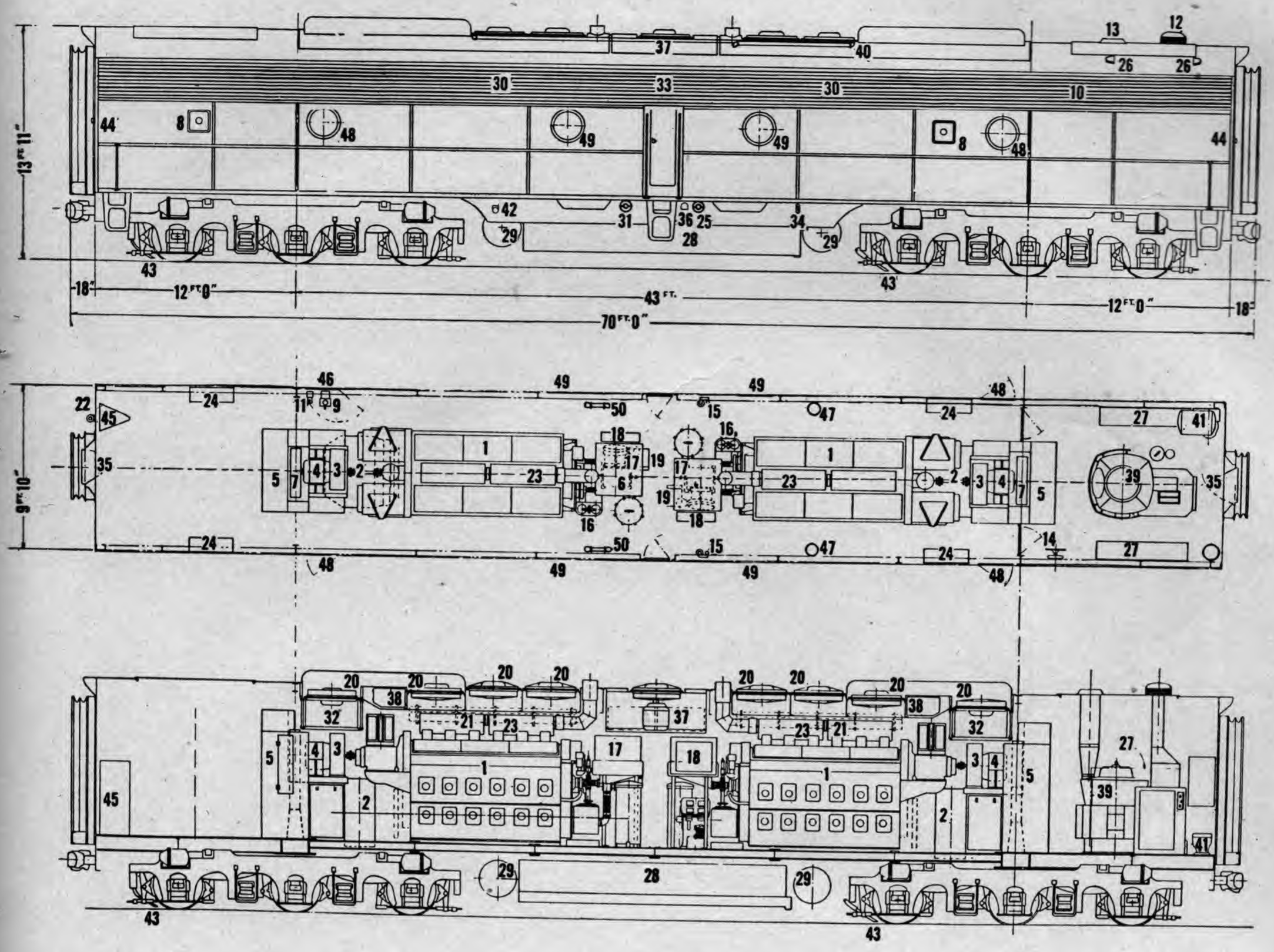


Location of Parts—General Motors 2,250-Hp., E8 Passenger Locomotive, A Unit

1. Engine—model 12-567-B
2. Main generator & alternator
3. Generator blower
4. Aux. generator
5. Control cabinet
6. Air compressor
7. Traction motor blower
8. Instrument panel
9. Controller
10. Speedometer recorder
11. Air brake stand
12. Cab heater
13. Seat
14. Hand brake
15. Fuel tank vent with flame arrestor
16. Lub. oil filler
17. Engine water tank & lub. oil cooler
18. Engine control & instrument panel
19. Load regulator
20. Fan & motor
21. Radiator
22. Horn
23. Exhaust manifold
24. Sand box
25. Fuel filler
26. Head light*
27. Batteries
28. Fuel (1,200 gal.) & water (1,200 gal.) tank
29. Main air reservoir
30. Air intake & shutters
31. Boiler water filler
32. Engine room ventilator
33. Air intake for grids
34. Fuel tank gauge
35. Door (plain)
36. Emergency fuel cut-off
37. Dynamic brake hatch*
38. A.C. contactor cabinet
39. Steam generator*
40. Air compressor aftercooler
41. Toilet
42. Battery charging receptacle
43. Sanding nozzles
44. Blue flag bracket
45. Air brake rack
46. Water cooler*
47. M.P. pipe line filter
48. Hinged sash
49. Fixed sash
50. Sand box filler
51. Steam generator room shutters
52. Number box
53. Steam generator air intake
54. Steam generator stack
55. Battery box vents
56. Water tank vent

* Modifications.

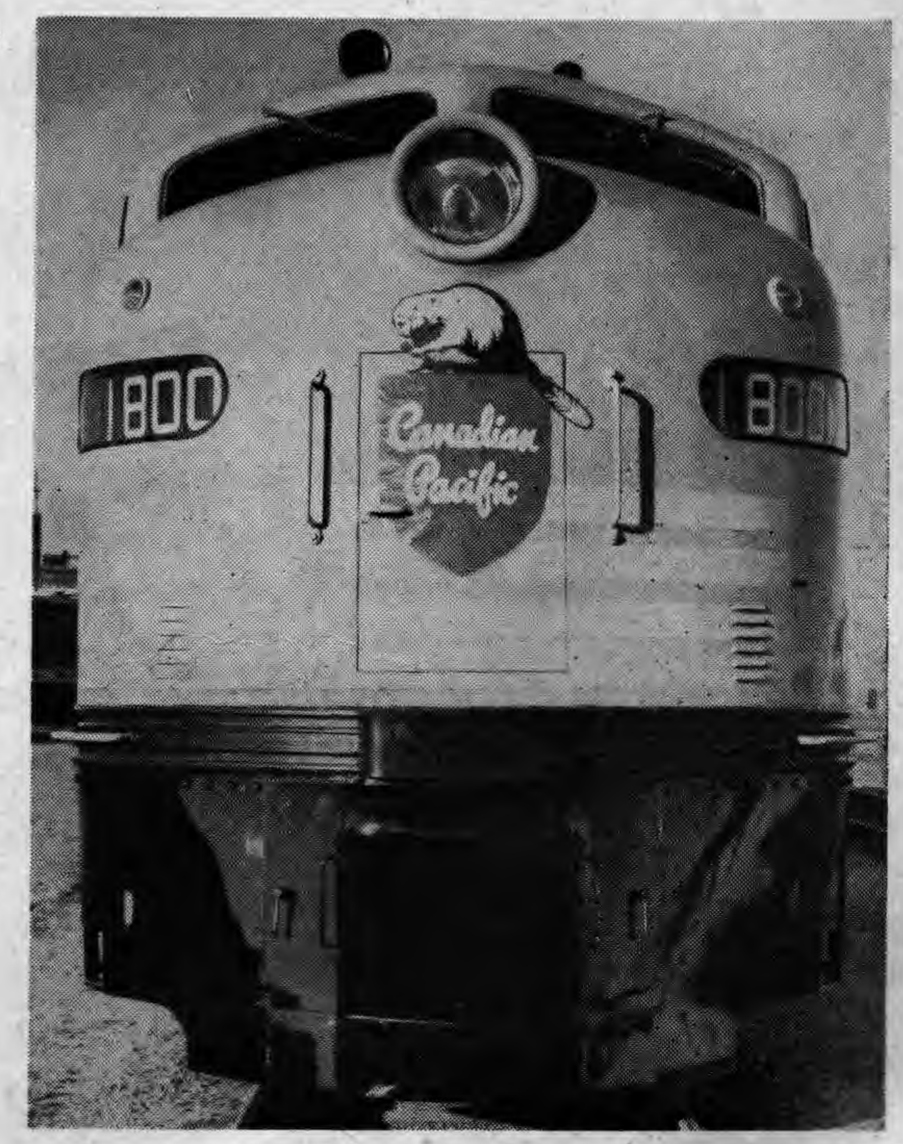
Electro-Motive Division—General Motors Corporation



Location of Parts—General Motors 2,250-Hp., E8 Passenger Locomotive, B Unit

1. Engine—model 12-567-B
2. Main generator & alternator
3. Generator blower
4. Aux. generator
5. Control cabinet
6. Air compressor
7. Traction motor blower
8. Sand box filler
9. Controller*
10. Boiler room shutters
11. Air brake stand *
12. Boiler air intake
13. Steam generator stack
14. Hand brake
15. Fuel tank vent & flame arrestor
16. Lub. oil filler
17. Engine water tank & lub. oil cooler
18. Engine control & instrument panel
19. Load regulator
20. Fan & motor
21. Radiator
22. Horn
23. Exhaust manifold
24. Sand box*
25. Fuel filler
26. Battery box vents
27. Batteries
28. Fuel (1,200 gal.) & Water (1,200 gal.) tank
29. Main air reservoir
30. Air intake & shutters
31. Boiler water filler
32. Engine room ventilator
33. Air intake for grids
34. Fuel tank gauge
35. Door
36. Emergency fuel cut-off
37. Dynamic brake hatch *
38. "A-C" contactor cabinet
39. Steam generator*
40. Air compressor aftercooler
41. Toilet
42. Battery charging receptacle
43. Sanding nozzles*
44. Blue flag bracket
45. Air brake rack
46. Hostler's hinged sash
47. M.R. pipe line filter
48. Hinged sash
49. Fixed sash
50. Water tank vent

* Modifications

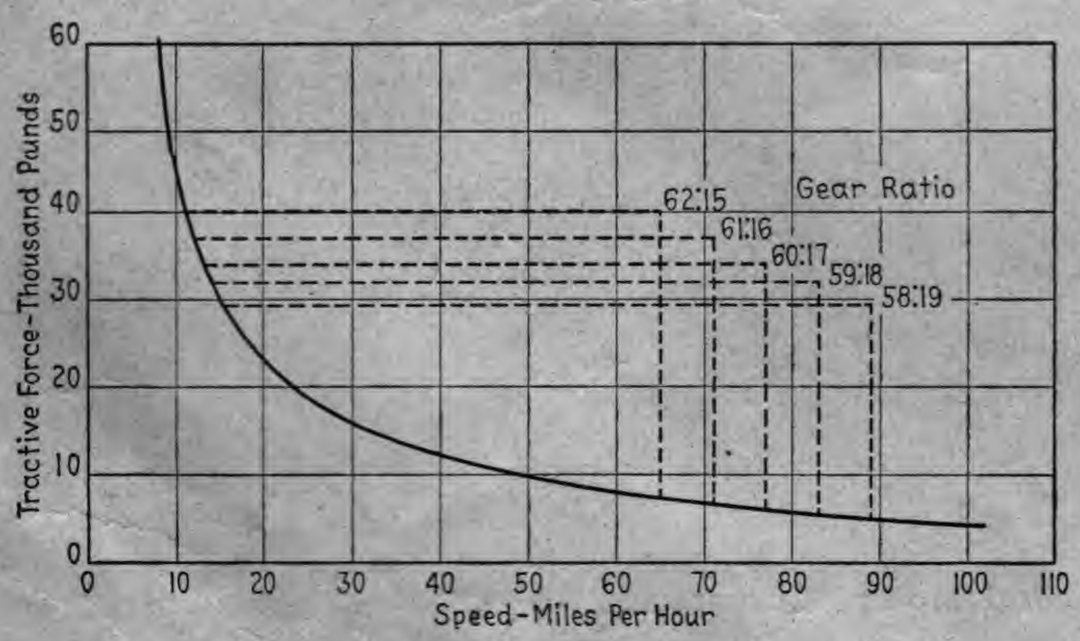


Electro-Motive Division—General Motors Corporation

General Motors 1,500-hp. FP7 heavy-duty passenger locomotive

Partial List of Railroads Using the FP7 Passenger Locomotive, As of March 31, 1950

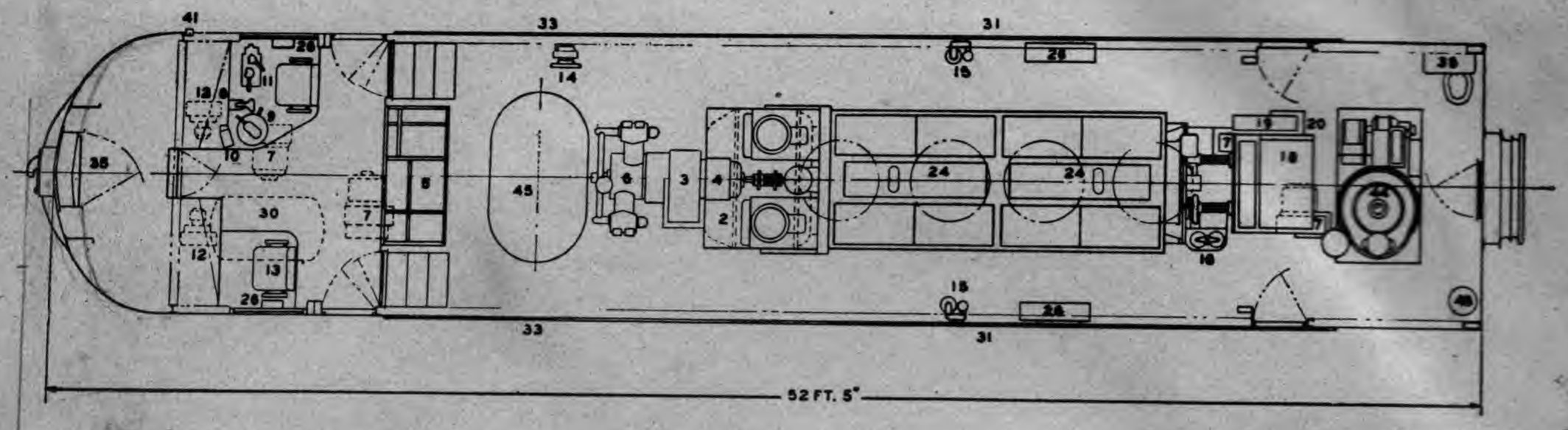
Atlanta & West Point
Chicago & Eastern Illinois
Chicago, Rock Island & Pacific
Georgia Railroad
Mexican Government Ry.
Western Pacific
Western Railway of Alabama

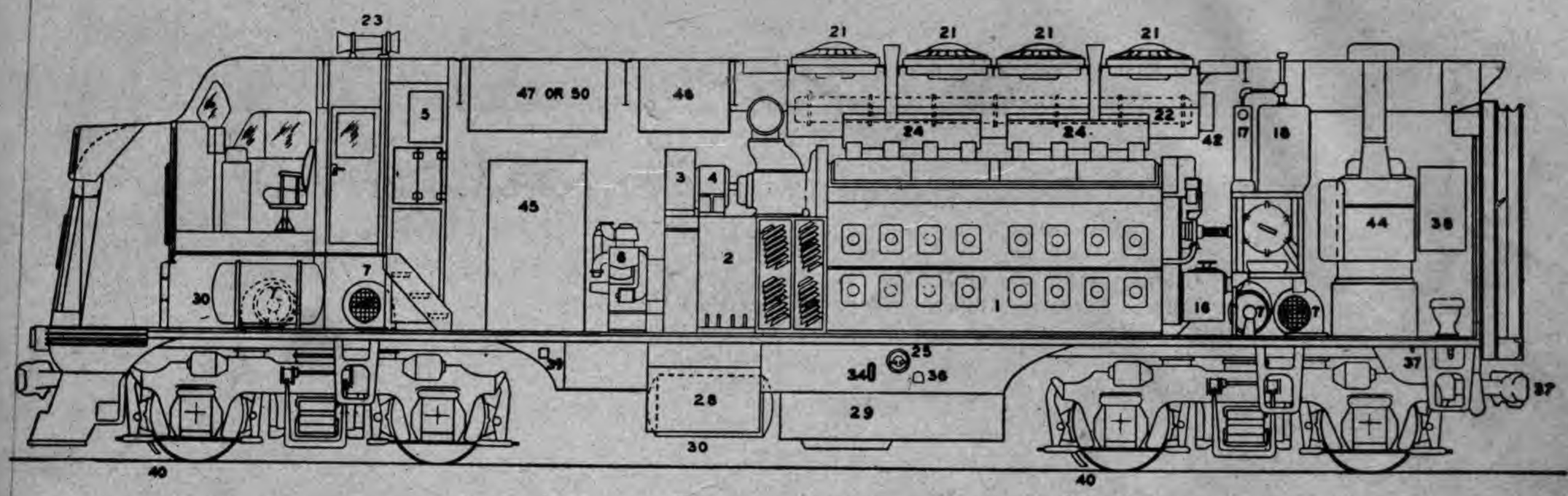


General Characteristics, Weights and Dimensions

Model	FP7
Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	16 cyl., 2-cycle, vee
Model	
Cylinders, bore and stroke, in.	8½ by 10
Horsepower available for traction	1,500
Traction motors, number	4
Journal bearings:	
Type	Roller
Size, in.	6½ by 12
Wheels, diameter, in.	40
Wheel base, ft.-in.:	
Truck	9-0
Locomotive	43-0
Distance between truck centers, ft.-in.	34-8
Maximum dimensions, over-all, ft.-in.:	
Width	10-8
Height	15-6
Length over coupler pulling faces	54-8
Weights in working order, lb.:	
Locomotive, total, approx.	258,000
On drivers, approx.	258,000
Truck, each	37,800
Minimum radius curvature, deg.	23
Supplies (total capacity):	
Lubricating oil, gal.	200
Fuel oil, gal.	1,200
Engine cooling water, gal.	230
Train heating water, gal:	
Without dynamic brakes	1,750
With dynamic brakes	1,150
Sand, cu. ft.	28
Air brake schedule	24-RL
Gear ratio	62:15, 61:16, 60:17, 59:18, 58:19
Continuous rating, tractive force, lb.	40,000, 37,000, 34,000, 32,000, 29,500
Maximum speed, m.p.h.	65, 71, 77, 83, 89

Electro-Motive Division—General Motors Corporation

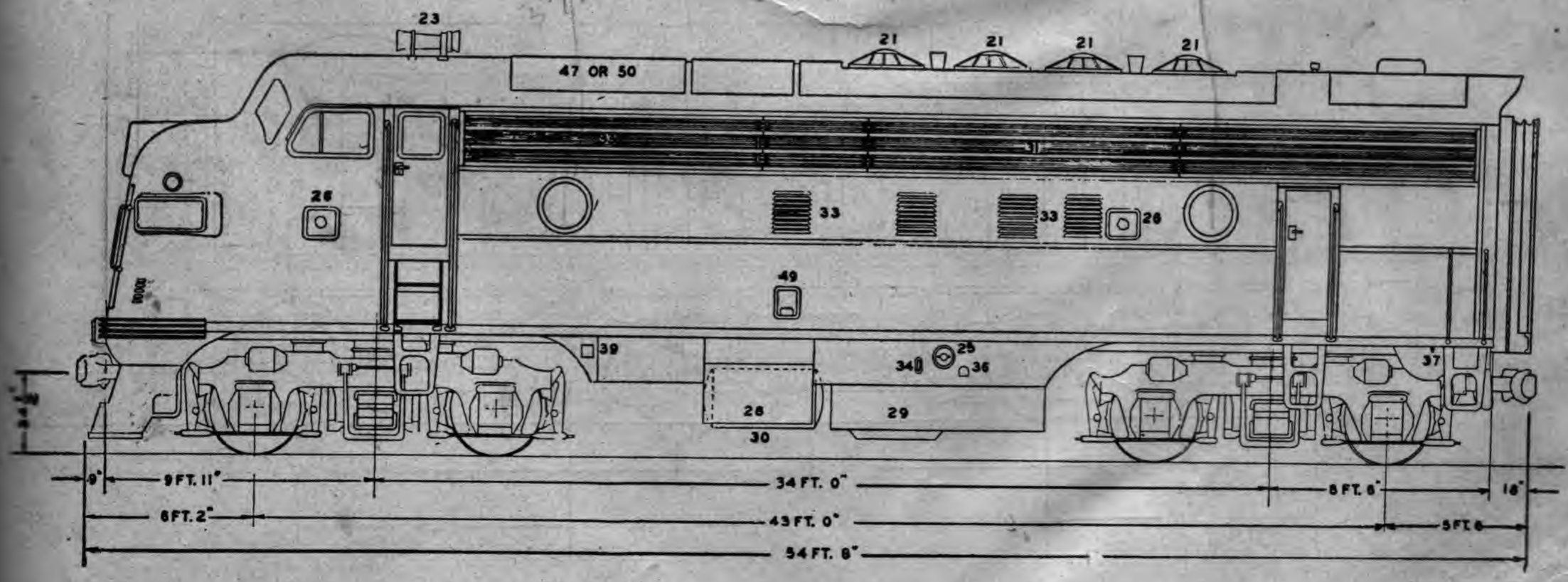




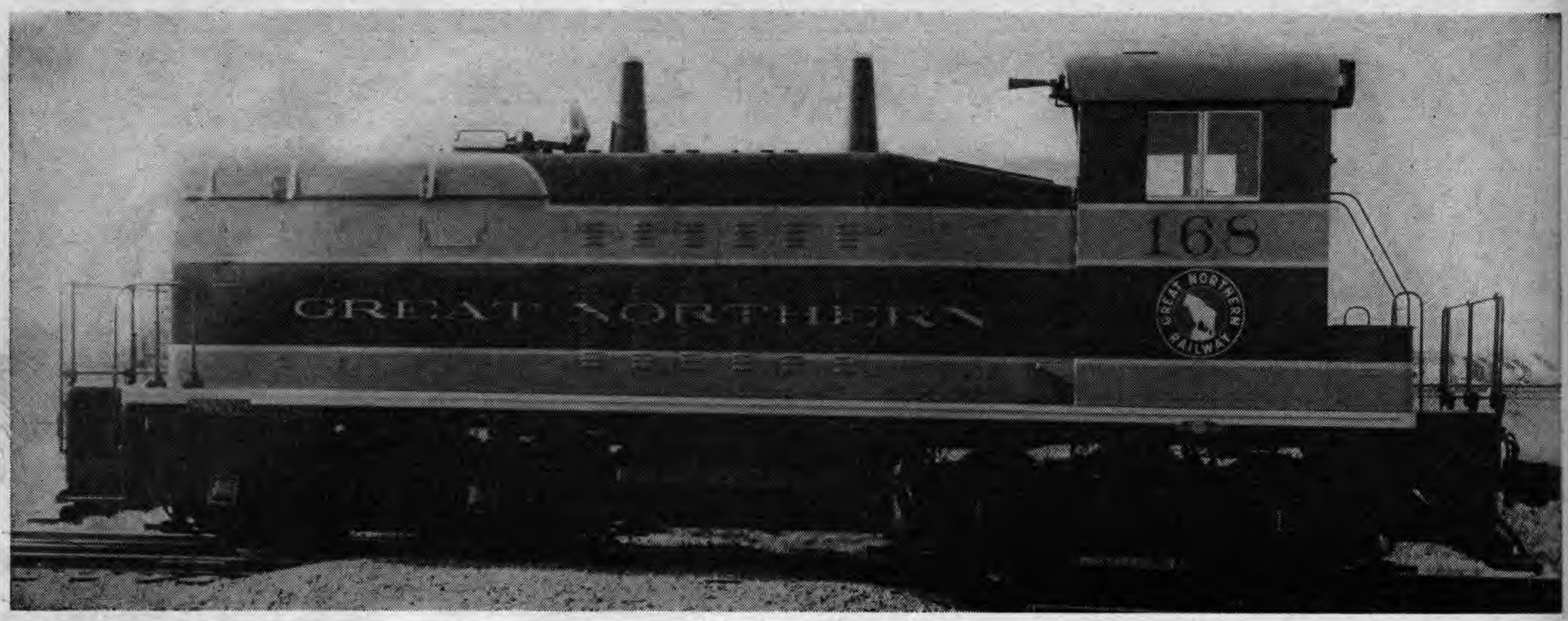
Key to Location of Principal Parts on the General-Motors 1,500-Hp. FP7 Heavy-Duty Passenger Locomotives

1. Engine EMD Model 16-567-B
2. Main generator and alternator
3. Generator blower
4. Auxiliary generator
5. Control cabinet
6. Air compressor
7. Traction-motor blower
8. Instrument board
9. Control stand
10. Speedometer recorder
11. Air-brake valve
12. Cab heater
13. Seat
14. Hand brake
15. Fuel-tank vent with flame arrestor
16. Lubricating-oil filter
17. Lubricating-oil cooler
18. Engine-water tank
19. Engine control and instrument panel
20. Load regulator
21. 34-in. fan and motor
22. Radiator
23. Horn
24. Exhaust manifold
25. Fuel filler
26. Sand box
27. Fixed-beam headlight
28. Batteries
29. 1,200-gal. fuel tank
30. Main air reservoir
31. Air intake and shutters
32. Coupler between units
33. Air intake for grids and engine room
34. Fuel-tank gauge
35. Plain door
36. Emergency fuel cut-off
37. Engine-water filter (both sides)
38. Toilet
39. Battery charging receptacle (left side only)
40. Sanding nozzles
41. Blue-flag bracket
42. a.c. contactor cabinet
43. Number box
44. Boiler
45. 820-gal. boiler-water tank
46. 330-gal. boiler-water tank
47. 600-gal. boiler-water tank
48. Boiler-water softener
49. Boiler-water filler (both sides)
50. Dynamic brake grids and blowers*

* Modifications

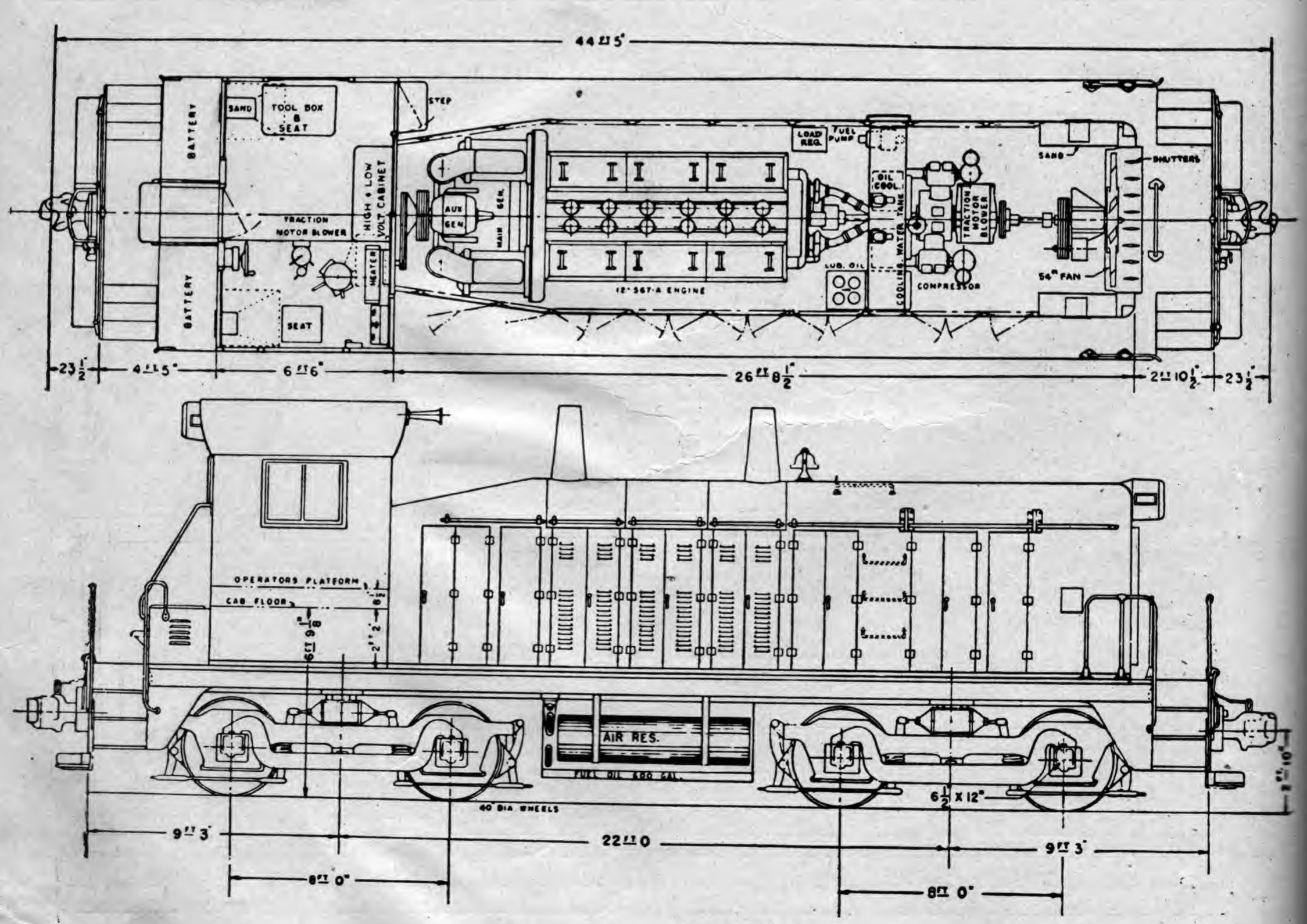


Electro-Motive Division—General Motors Corporation



Partial List of Railroads Using General Motors 1,200-Hp. Switching Locomotives SW-7

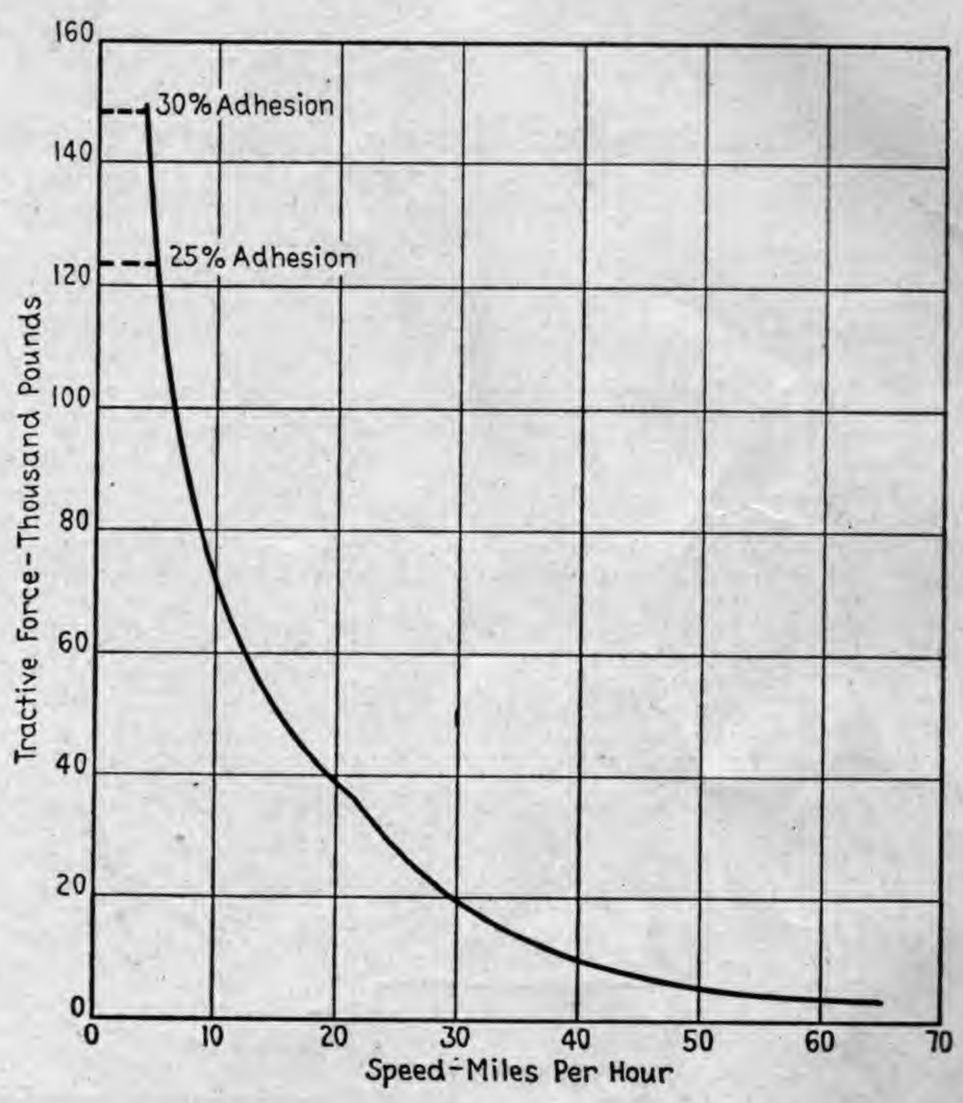
Chesapeake & Ohio (P.M.)
Chicago & Eastern Illinois
Great Northern
Illinois Central
Lehigh Valley
Louisville & Nashville
New York Central
Northern Pacific
Pennsylvania
Southern

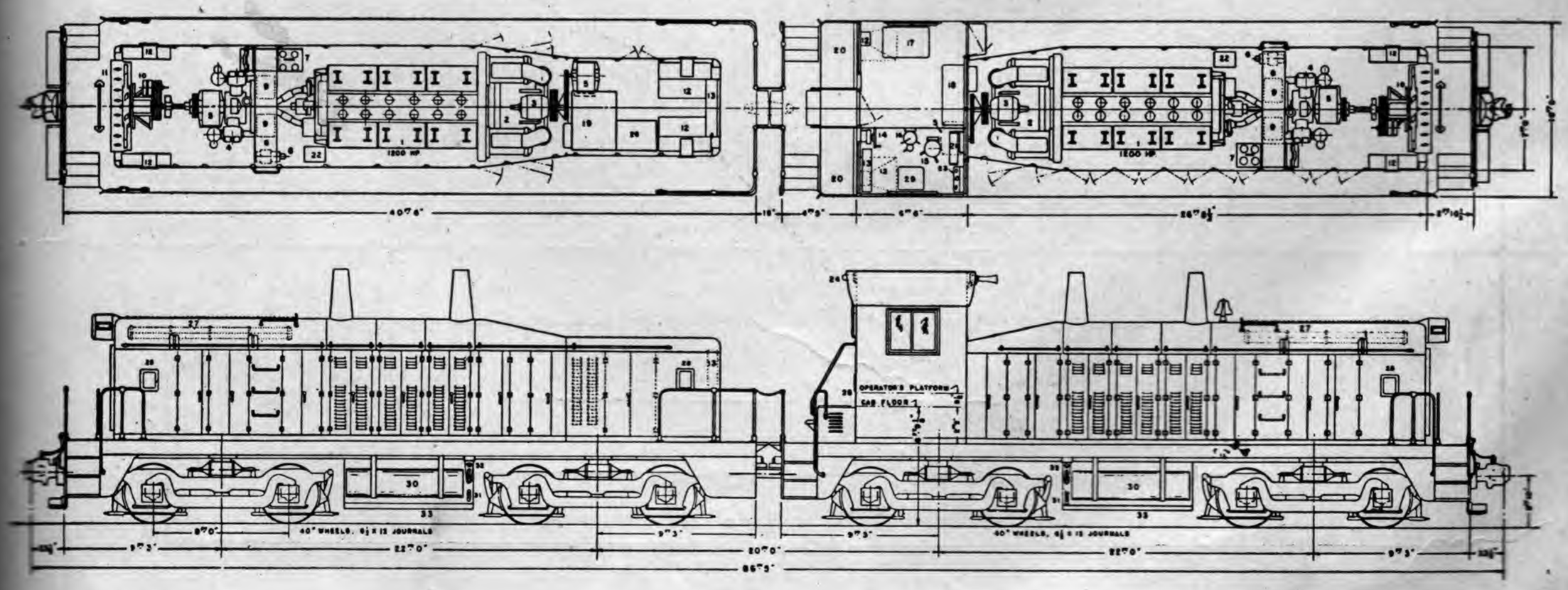


Electro-Motive Division—General Motors Corporation

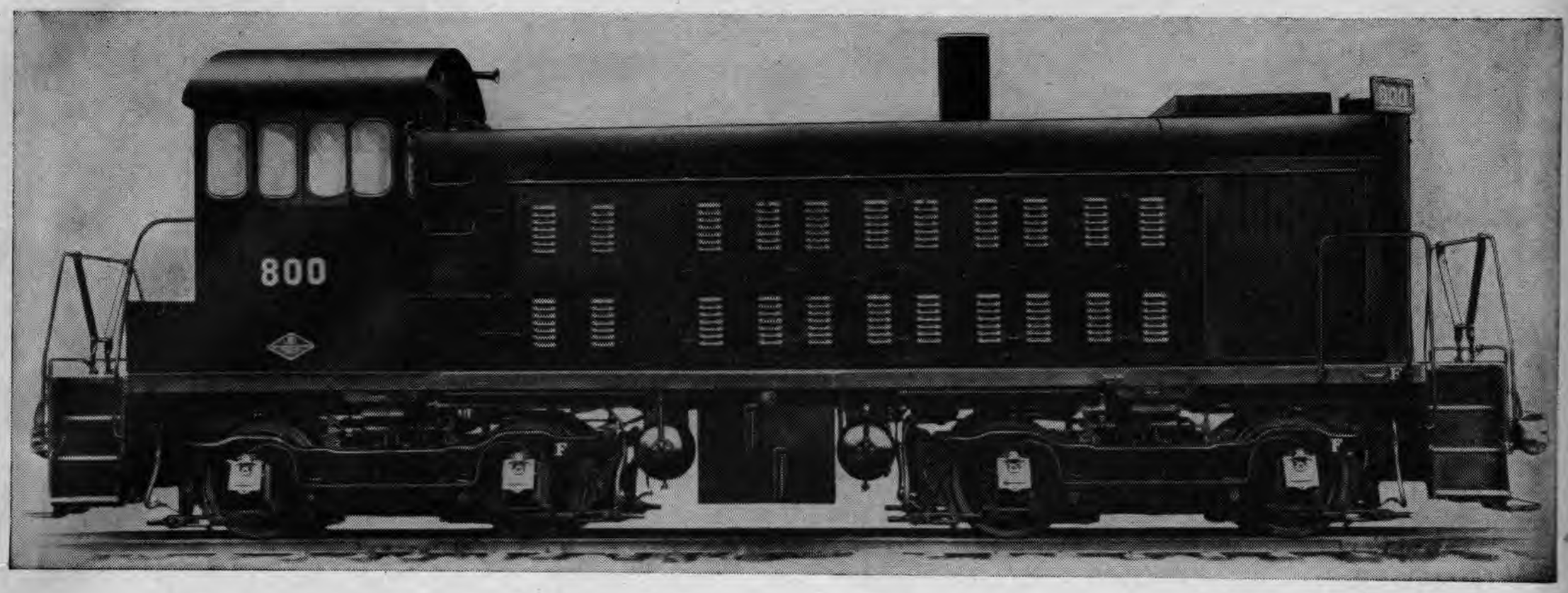
General Motors 2,400-Hp. Transfer Locomotive
General Characteristics, Weights and Dimensions

Model	TR-4
Type:	
Whyte symbol	0-4-4-0 + 0-4-4-0
A.A.R. symbol	B-B + B-B
Engines:	
Number per unit	One
Type	12 cyl., 2-cycle, vee
Cylinders, bore and stroke, in.	8½ by 10
Horsepower available for traction	1,200
Traction motors, number	4
Journal bearings:	
Type	Plain
Size, in.	6½ by 12
Wheels, diameter, in.	40
Wheel base, ft.-in.:	
Truck	8-0
Locomotive	72-0
Distance between truck centers, ft.-in.	64-0
Maximum dimensions, over-all, ft.-in.:	
Width	10-0
Height	14-6¼
Length over coupler pulling faces	86-5
Weights in working order, lb.:	
Locomotive, total, approx.	496,000
On drivers, approx.	496,000
Minimum radius curvature, ft.	100
Supplies (total capacity):	
Lubricating oil, gal.	330
Fuel oil, gal.	1,200
Engine cooling water, gal.	446
Sand, cu. ft.	56
Air brake schedule	
Gear ratio	62.15
Continuous rating, tractive force, lb.	62,400
Maximum speed, m.p.h.	65



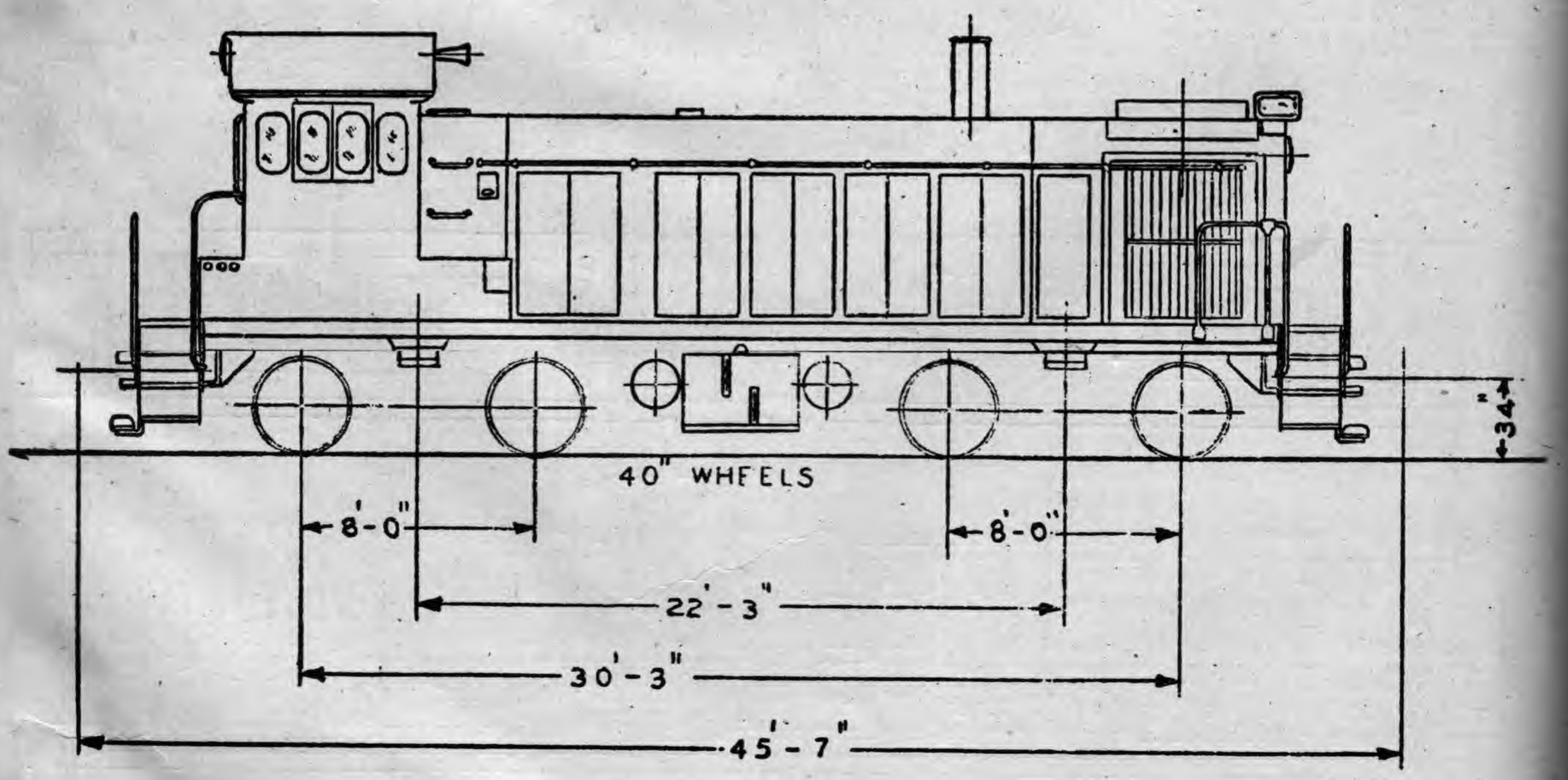


Electro-Motive Division—General Motors Corporation

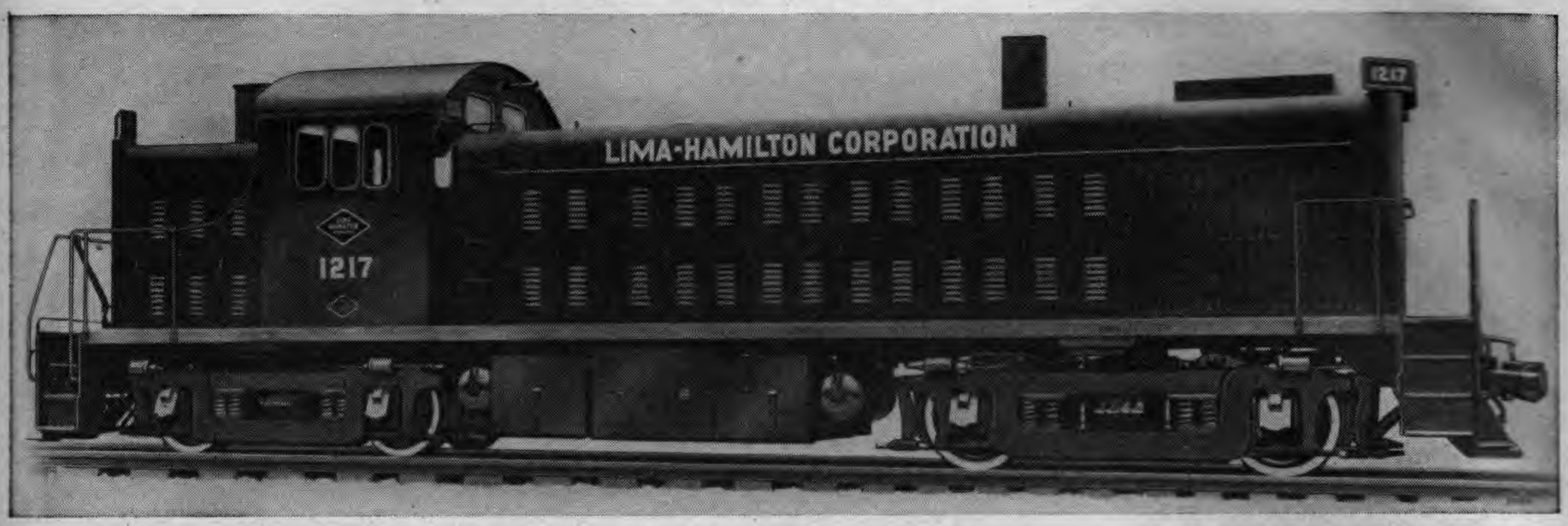


Lima-Hamilton 800-Hp. Switching Locomotive General Characteristics, Weights and Dimensions

Model	
Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	6 cyl.,4 cycles, in line
Cylinders, bore and stroke, in	9 by 12
Horsepower available for traction	800
Generator:	
Make	Westinghouse
Type	499A
Traction motors:	
Number	4
Make	Westinghouse
Type	362D
Journal bearings:	
Type	Plain
Size	6½ by 12
Wheels, diameter, in.	40
Wheel base, ft.-in.:	
Truck	8-0
Locomotive	30-3
Distance between truck centers, ft.-in.	22-3
Maximum dimensions, over-all, ft.-in.:	
Width	10-2½
Height	14-6
Length over coupler pulling faces	45-7
Weights in working order lb.:	
Locomotive, total approx. (unless otherwise specified)	230,000
On drivers, approx.	230,000
Minimum radius curvature, ft. (with train)	100
Supplies (total capacity):	
Lubricating oil, gal.	130
Fuel oil, gal.	600
Engine cooling water, gal.	190
Sand, cu. ft.	30
Air brake schedule	6SL
Gear ratio	14:68
Starting tractive force, lb.:	
At 25 per cent adhesion	57,500
At 30 per cent adhesion	69,000
Maximum speed, m.p.h.	60

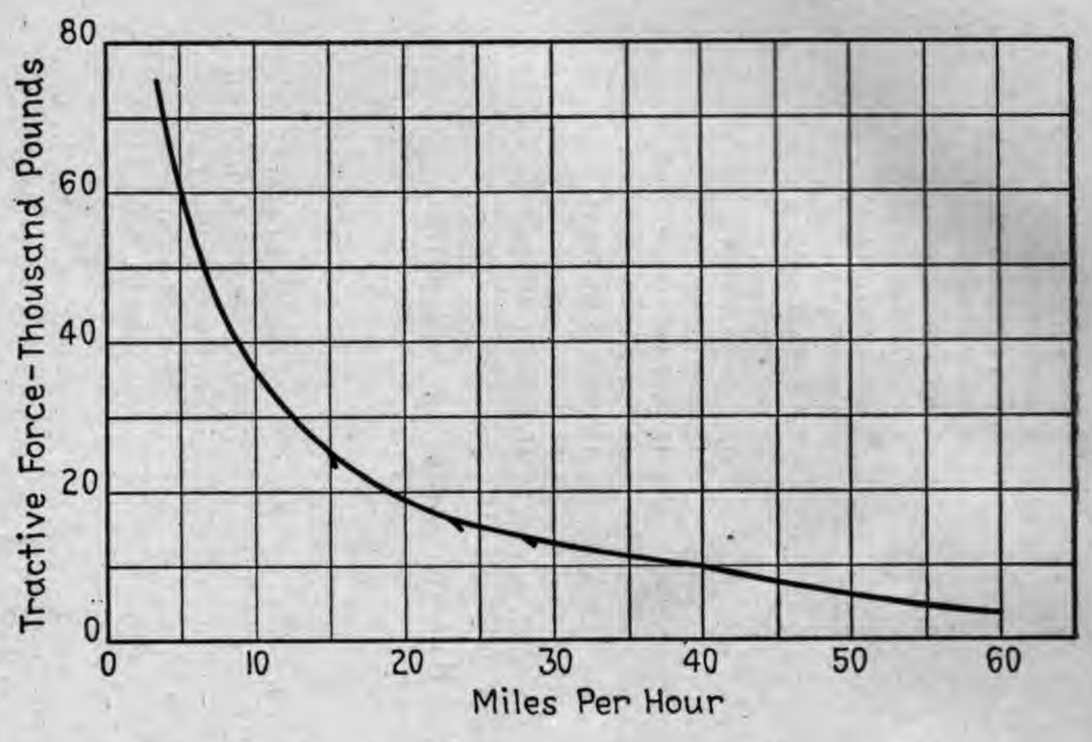


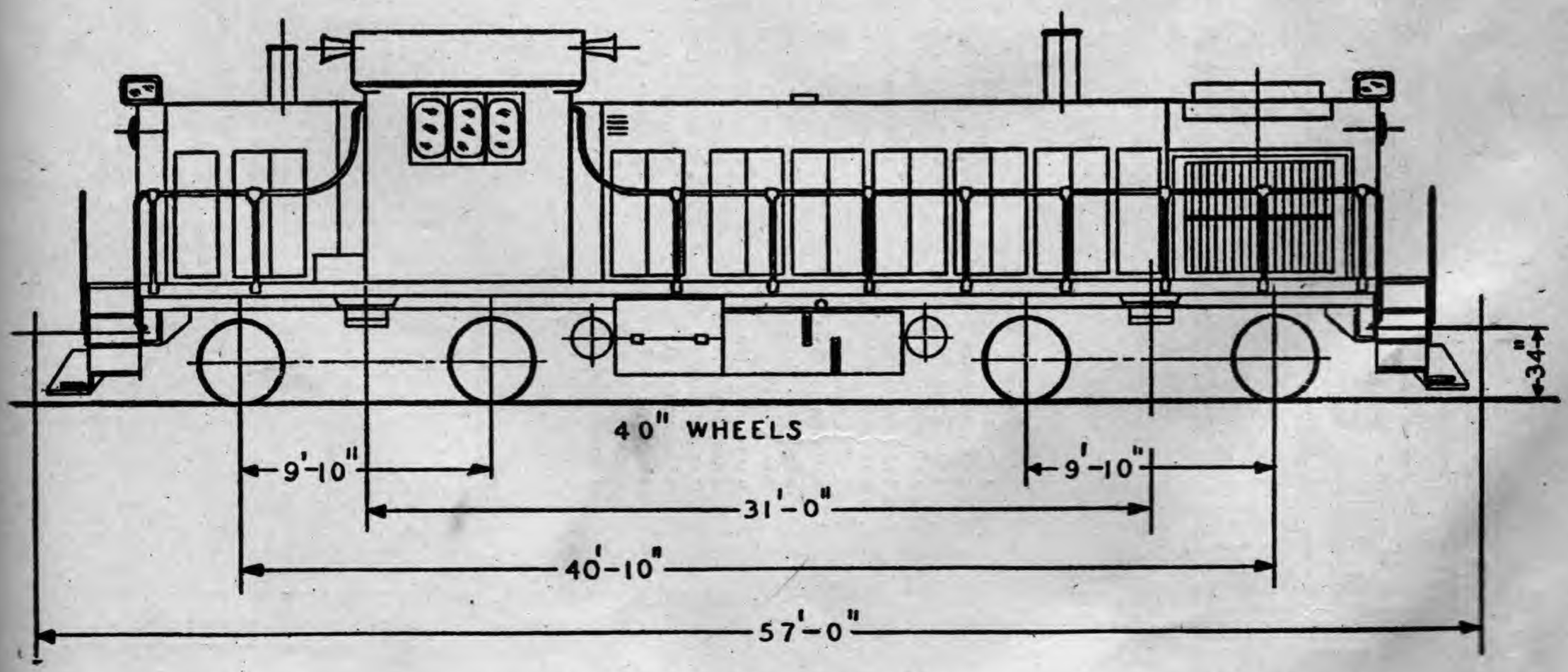
Lima-Hamilton Corporation



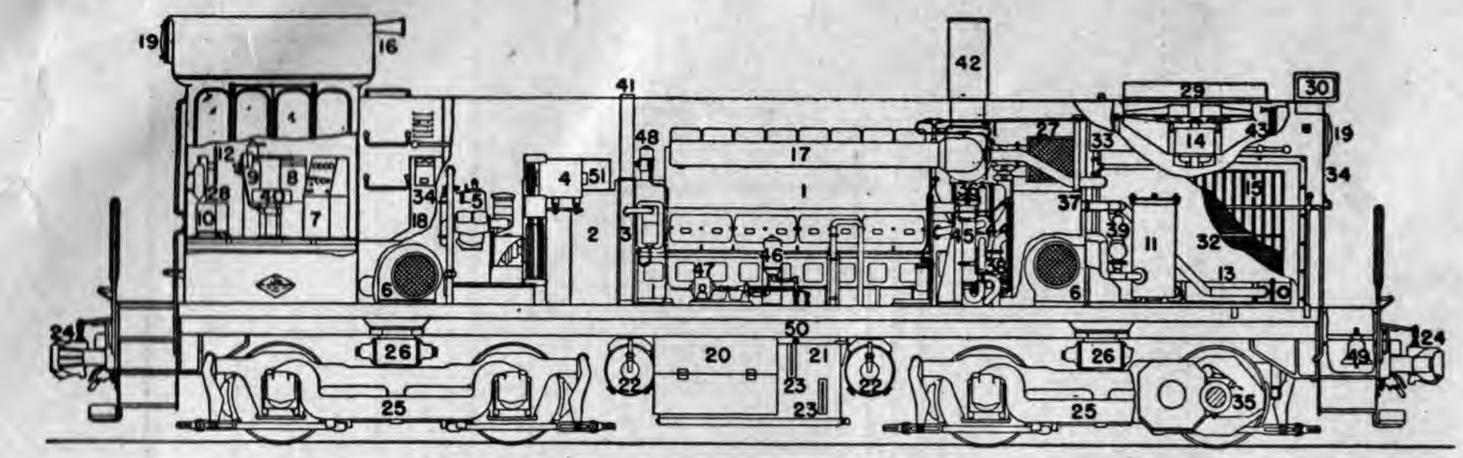
Lima-Hamilton 1,200 Hp. Road Switching Locomotive
General Characteristics, Weights and Dimensions

Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	8 cyl., 4 cycle, in line
Cylinders, bore and stroke, in.	9 by 12
Horsepower available for traction	1,200
Generator:	
Make	Westinghouse
Type	499A
Traction motors:	
Number	4
Make	Westinghouse
Type	362D
Journal bearings:	
Type	Plain
Size	6½ by 12
Wheels, diameter, in.	40
Wheel base, ft.-in.:	
Truck	9-10
Locomotive	40-10
Distance between truck centers, ft.-in.:	31-0
Maximum dimensions, over-all, ft.-in.:	
Width	10-2½
Height	14-6
Length over coupler pulling faces	57-0
Weights in working order, lb.:	
Locomotive, total, approx.	250,000
On drivers, approx.	250,000
Minimum radius curvature, ft. (with train)	150
Supplies (total capacity):	
Lubricating oil, gal.	145
Fuel oil, gal.	800
Engine cooling water, gal.	225
Train heating water, gal.	800
Sand, cu. ft.	30
Air brake schedule	6SL
Gear ratio	14:68
Starting tractive force, lb.:	
At 25 per cent adhesion	62,500
At 30 per cent adhesion	75,000
Maximum speed, m.p.h.	60





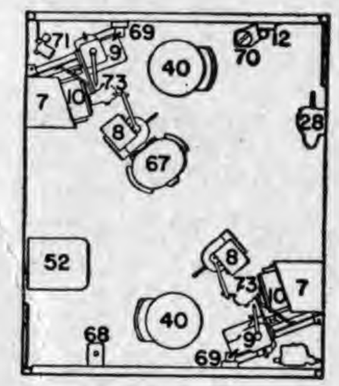
Lima-Hamilton Corporation



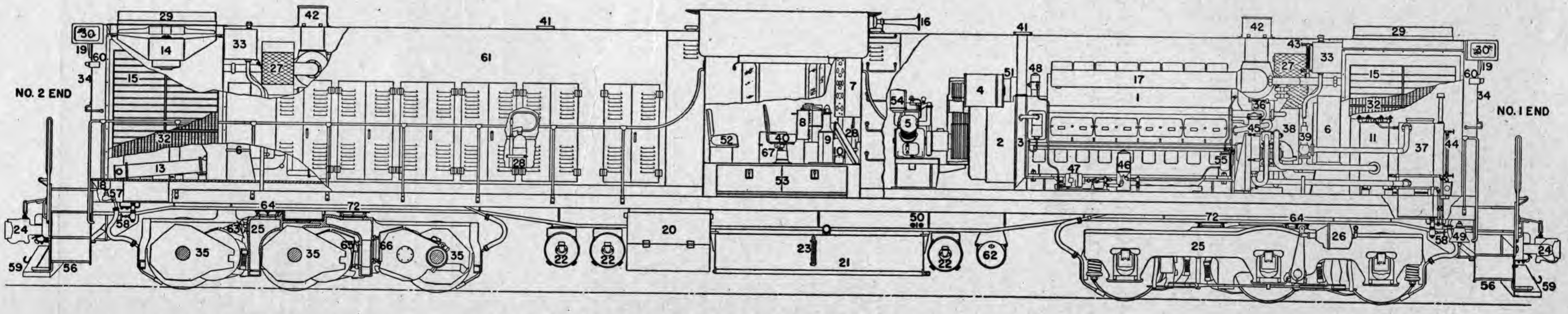
1. ENGINE
2. MAIN GENERATOR
3. MAIN GENERATOR BLOWER
4. FAN GENERATOR
5. AIR COMPRESSOR
6. TRACTION MOTOR BLOWER
7. INSTRUMENT PANEL
8. CONTROLLER
9. AIR BRAKE VALVE
10. CAB HEATERS
11. LUBE OIL FILTER
12. HAND BRAKE
13. HEAT EXCHANGER
14. COOLING FAN AND MOTOR
15. RADIATOR SHUTTERS
16. HORN
17. EXHAUST MANIFOLD
18. SAND BOX
19. HEAD LIGHT
20. BATT'Y. BOX (BOTH SIDES)
21. FUEL TANK
22. MAIN AIR RESERVOIR
23. FUEL TANK GAUGE
24. COUPLER AND DRAFT GEAR
25. TRUCKS
26. BRAKE CYLINDER
27. ENGINE AIR INTAKE FILTER
28. FIRE EXTINGUISHER
29. BALANCED SHUTTERS
30. NUMBER LIGHT (FRONT)
31. TURBOCHARGER
32. RADIATOR
33. WATER TANK
34. SAND BOX FILLER
35. TRACTION MOTOR
36. INTERCOOLER
37. LUBE OIL TANK
38. LUBE OIL PUMPS
39. LUBE OIL RELIEF VALVE
40. ENGINEMAN SEAT
41. GENERATOR EXHAUST STACK
42. ENGINE EXHAUST STACK
43. WATER SIGHT GAUGE
44. LUBE OIL SIGHT GAUGE
45. LUBE OIL STRAINER
46. FUEL OIL FILTER
47. FUEL TRANSFER PUMP MOTOR
48. ENGINE GOVERNOR
49. BELL
50. EMERGENCY FUEL SHUTOFF VALVE
51. AUXILIARY GENERATOR EXCITER

Location of equipment in Lima-Hamilton switching locomotives.

1. ENGINE
2. MAIN GENERATOR
3. MAIN GENERATOR BLOWER
4. FAN GENERATOR
5. AIR COMPRESSOR
6. TRACTION MOTOR BLOWER COVER
7. GAUGE PANEL
8. MASTER CONTROLLER,
9. AIR BRAKE VALVE
10. CAB HEATER
11. LUBE OIL FILTER
12. HAND BRAKE
13. HEAT EXCHANGER
14. COOLING FAN AND MOTOR
15. RADIATOR SHUTTERS
16. HORN
17. EXHAUST MANIFOLD
18. SAND BOX
19. HEAD LIGHT
20. BATTERY BOX (BOTH SIDES)
21. FUEL TANK
22. MAIN RESERVOIR
23. FUEL TANK GAUGE
24. COUPLER AND DRAFT GEAR
25. TRUCKS
26. BRAKE CYLINDER
27. ENGINE AIR INTAKE FILTER
28. FIRE EXTINGUISHER
29. BALANCED SHUTTERS
30. NUMBER LIGHTS
31. TURBOCHARGER
32. RADIATOR
33. WATER TANK
34. SAND BOX FILLERS
35. TRACTION MOTOR
36. INTERCOOLER
37. LUBE OIL TANK
38. LUBE OIL PUMPS
39. LUBE OIL RELIEF VALVE
40. ENGINEMAN SEAT
41. GENERATOR EXHAUST STACK
42. ENGINE EXHAUST STACK
43. WATER SIGHT GAUGE
44. LUBE OIL SIGHT GAUGE
45. LUBE OIL STRAINER
46. FUEL OIL FILTER (SUCTION)
47. FUEL TRANSFER PUMP MOTOR
48. ENGINE GOVERNOR
49. BELL
50. EMERGENCY FUEL SHUT-OFF VALVE
51. AUXILIARY GENERATOR EXCITER
52. BRAKEMAN SEAT
53. CAB SIDE DOORS
54. AIR COMPRESSOR FILTER
55. FUEL OIL FILTER (PRESSURE)
56. STEPS
57. SAND TRAP
58. LUBE OIL TANK DRAIN
59. PILOT
60. FLAG BRACKET AND LAMP SOCKET
61. ENGINE HOOD
62. AUX. EMERG. & DISPLACEMENT VOL. RESERVOIR
63. TOP MOTOR BOOT
64. TRUCK MOTOR BOOT (OUTER)
65. REAR MOTOR BLOWING ANGLED BOOT
66. REAR MOTOR BLOWING BOOT
67. WATER COOLER
68. TRANSFER SWITCH
69. SANDER & BELL RINGER VALVE
70. ROTAIR VALVE
71. REDUCING VALVE
72. TRUCK MOTOR BOOT (INNER)
73. INDEPENDENT BRAKE VALVE



CAB INTERIOR (PLAN VIEW)



Location of equipment in Lima-Hamilton 2,400-hp. transfer locomotive.

Lima-Hamilton Corporation

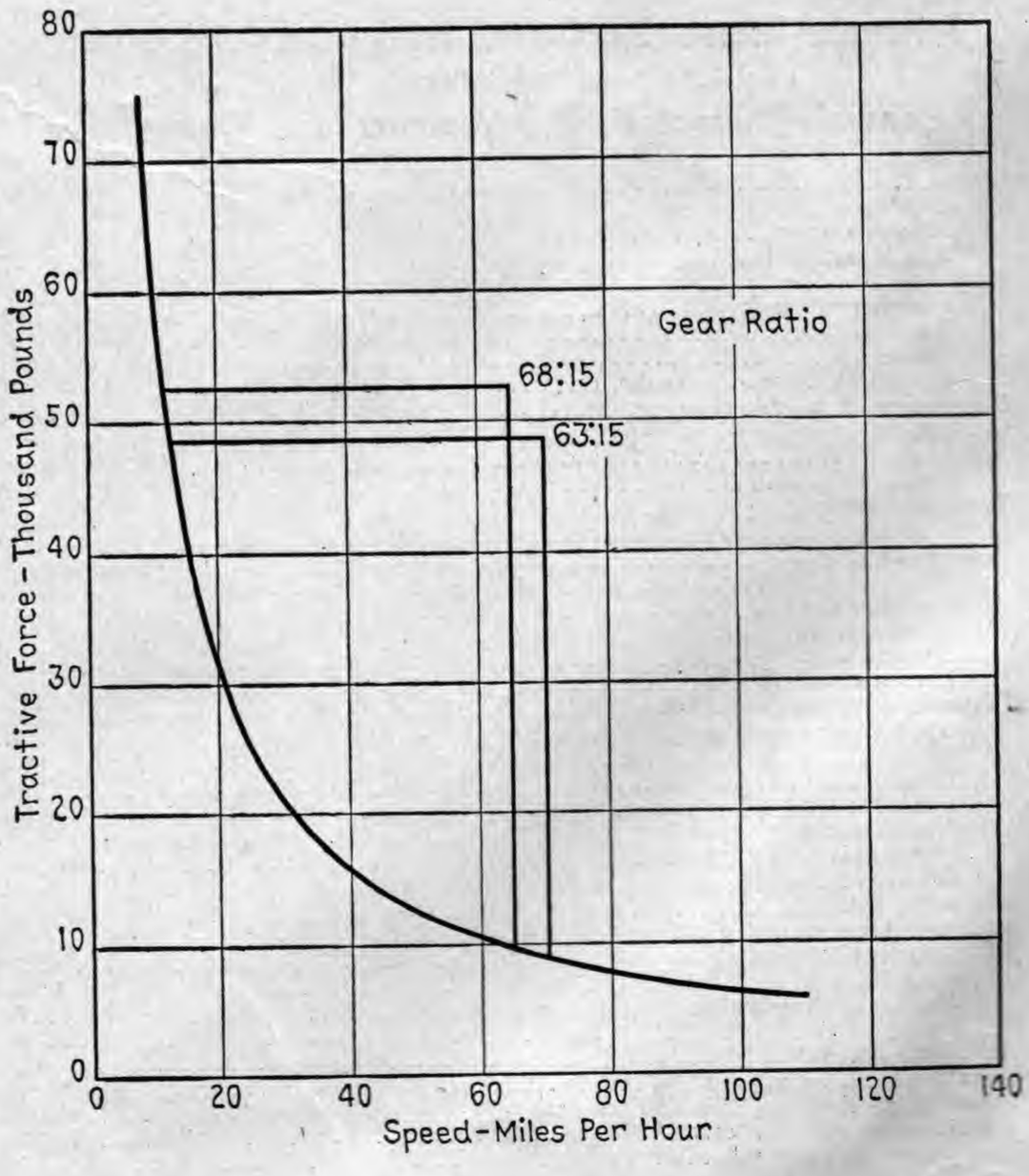
Partial List of Railroads Using the Fairbanks-Morse 2,000-hp. Heavy Duty Locomotive H20-44

Akron, Canton & Youngstown
New York Central
Pennsylvania
Pittsburgh & West Virginia
Union Pacific

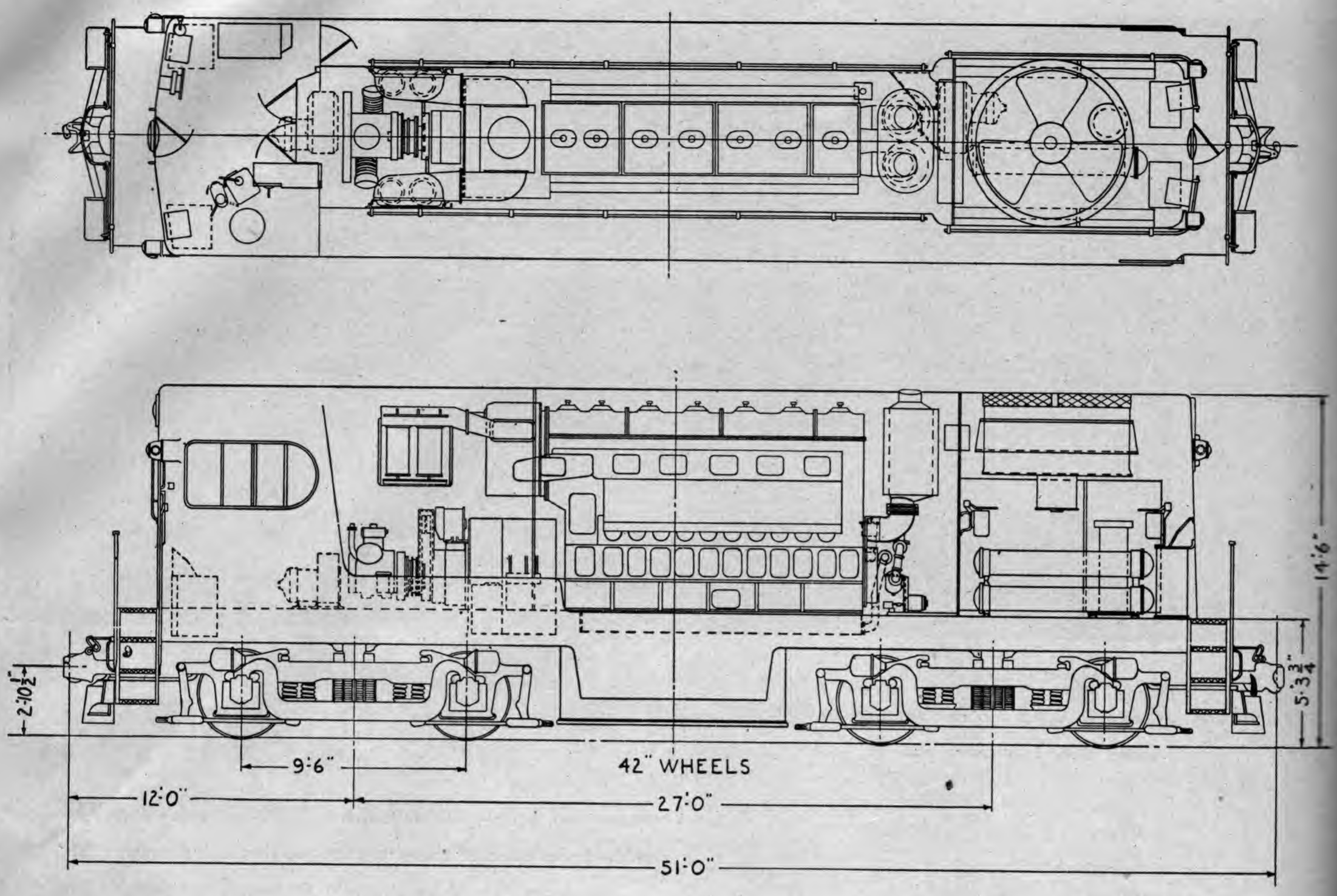
Above and below—Fairbanks-Morse 2,000-hp. heavy-duty locomotive H20-44. For table of characteristics, weights and dimensions of 2,000 hp. heavy duty locomotive with six motors see opposite page.

Fairbanks-Morse 2,000-Hp. Heavy-Duty Locomotive General Characteristics, Weights and Dimensions

Model	H20-44
Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	10 cyl., 2 cycle, opposed piston
Model	38D8⅛
Cylinders, bore and stroke, in.	8⅛ by 10
Horsepower available for traction	2,000
Generator:	
Make	Westinghouse
Type	474-A
Traction motors:	
Number	4
Make	Westinghouse
Type	370-F
Journal bearings:	
Type	Plain
Size	7 by 14
Wheels, diameter, in.	42
Wheel base, ft.-in.:	
Truck	9-6
Locomotive	36-6
Distance between truck centers, ft.-in.	27-0
Maximum dimensions, over-all, ft.-in.:	
Width	10-6
Height	14-6
Length over coupler pulling faces	51-0
Weights in working order, lb.:	
Locomotive, total, approx.	250,000
On drivers, approx.	250,000
Minimum radius curvature, deg. (with train)	23
Supplies (total capacity):	
Lubricating oil, gal.	350
Fuel oil, gal.	1,200
Engine cooling water, gal.	200
Sand, cu. ft.	28
Air brake schedule	6SL
Starting tractive force, lb. (30 per cent adhesion)	75,000
Gear ratio	68:15, 63:15
Continuous rating, tractive force, lb.	52,500, 48,600
Maximum speed, m.p.h.	65, 70



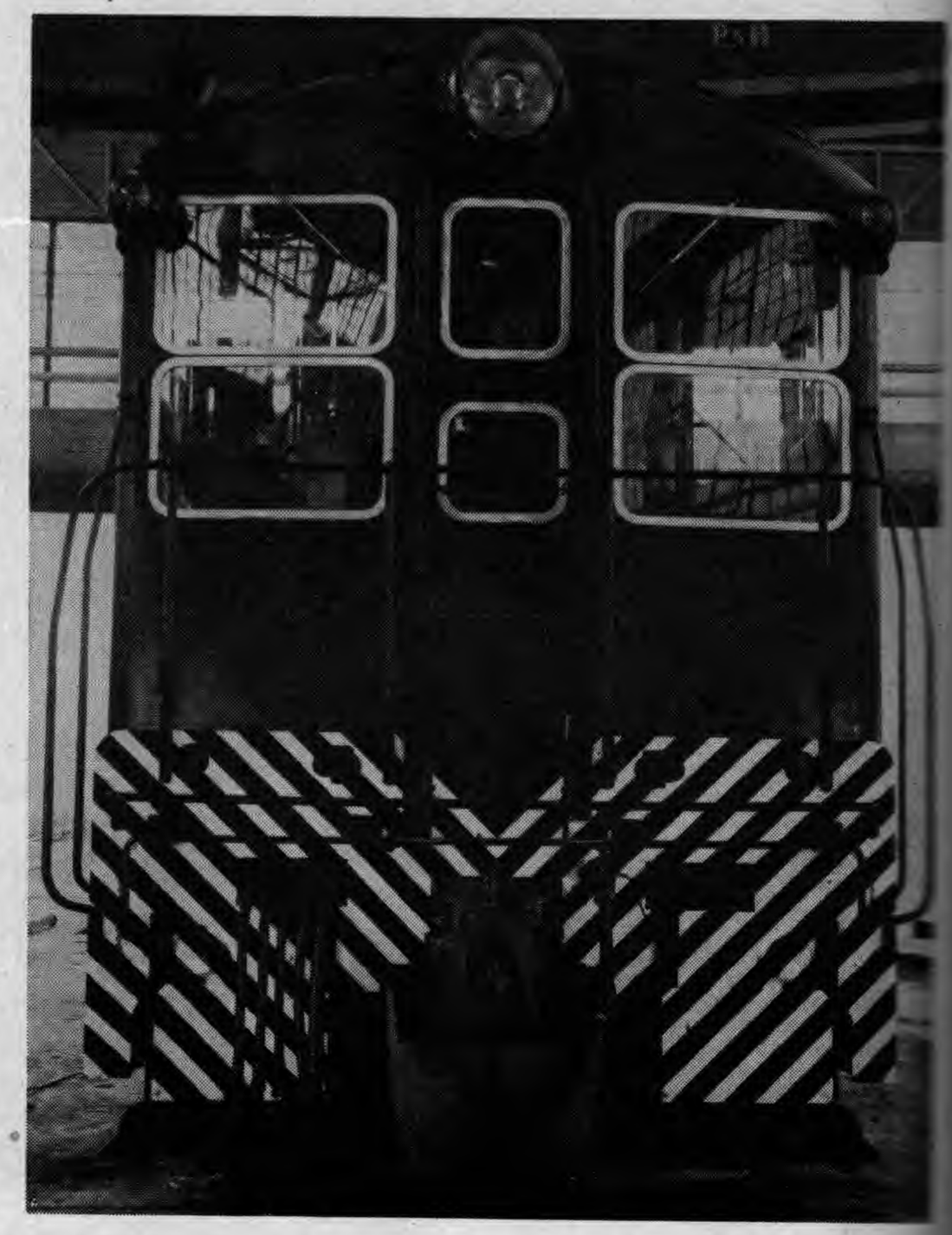
Fairbanks, Morse and Company



Side elevation and plan of Fairbanks-Morse 2,000-hp. heavy-duty locomotive H20-44.

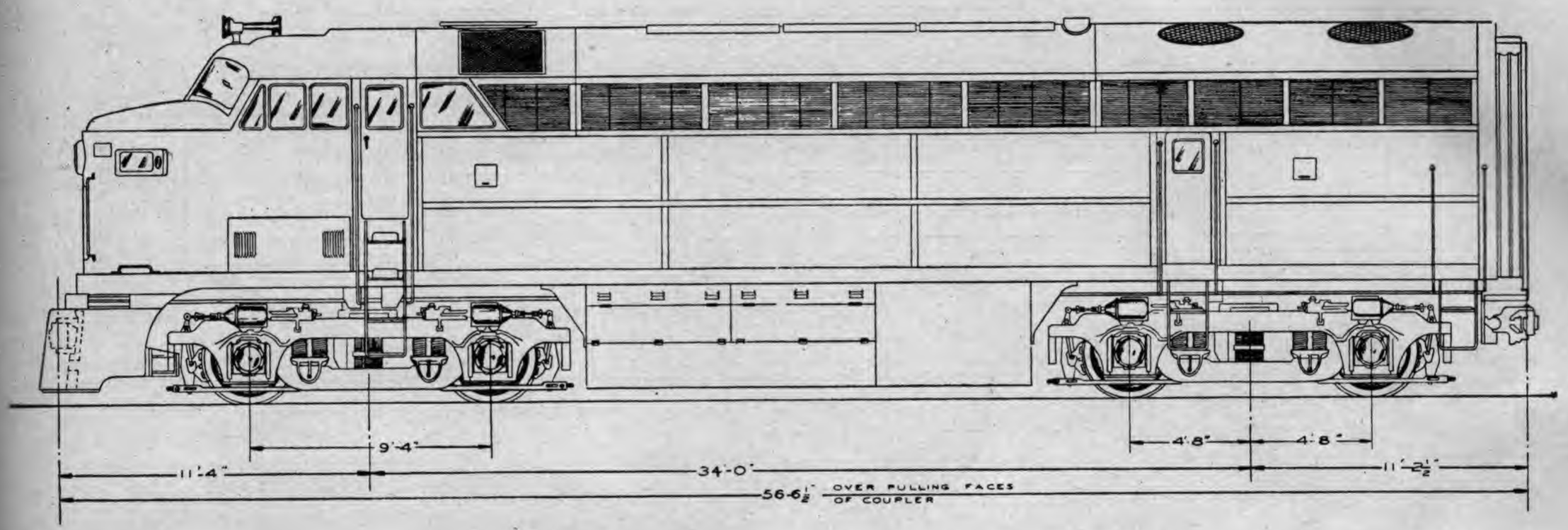
Fairbanks-Morse 2,000-Hp. Heavy-Duty Locomotive (Six-Motors)
General Characteristics, Weights and Dimensions

Model	H20-66
Type:	
Whyte symbol	0-6-6-0
A.A.R. symbol	C-C
Engines:	
Number per unit	One
Type	10 cyl., 2-cycle, opposed piston
Model	38D8⅛
Cylinders, bore and stroke, in.	8⅛ by 10
Horsepower available for traction	2,000
Generator:	
Make	Westinghouse
Type	474-A
Traction motors:	
Number	6
Make	Westinghouse
Type	370G
Wheels, diameter, in.	42
Wheel base, ft.-in.:	
Truck	13-0
Locomotive	39-3
Distance between truck centers, ft.-in.	27-0
Maximum dimensions, over-all, ft.-in.:	
Width	10-6
Height	15-0
Length over coupler pulling faces	52-8
Weights in working order, lb.:	
Locomotive, total, approx.	280,000
On drivers, approx.	280,000
With ballast	330,000
Supplies (total capacity):	
Lubricating oil, gal.	350
Fuel oil, gal.	1,200
Engine cooling water, gal.	200
Sand, cu. ft.	28
Air brake schedule	6SL
Gear ratio	63:15
Starting tractive force, lb. (30 per cent adhesion with ballast)	99,000
Continuous rating, tractive force, lb.	72,900
Maximum speed, m.p.h.	70



Fairbanks, Morse and Company

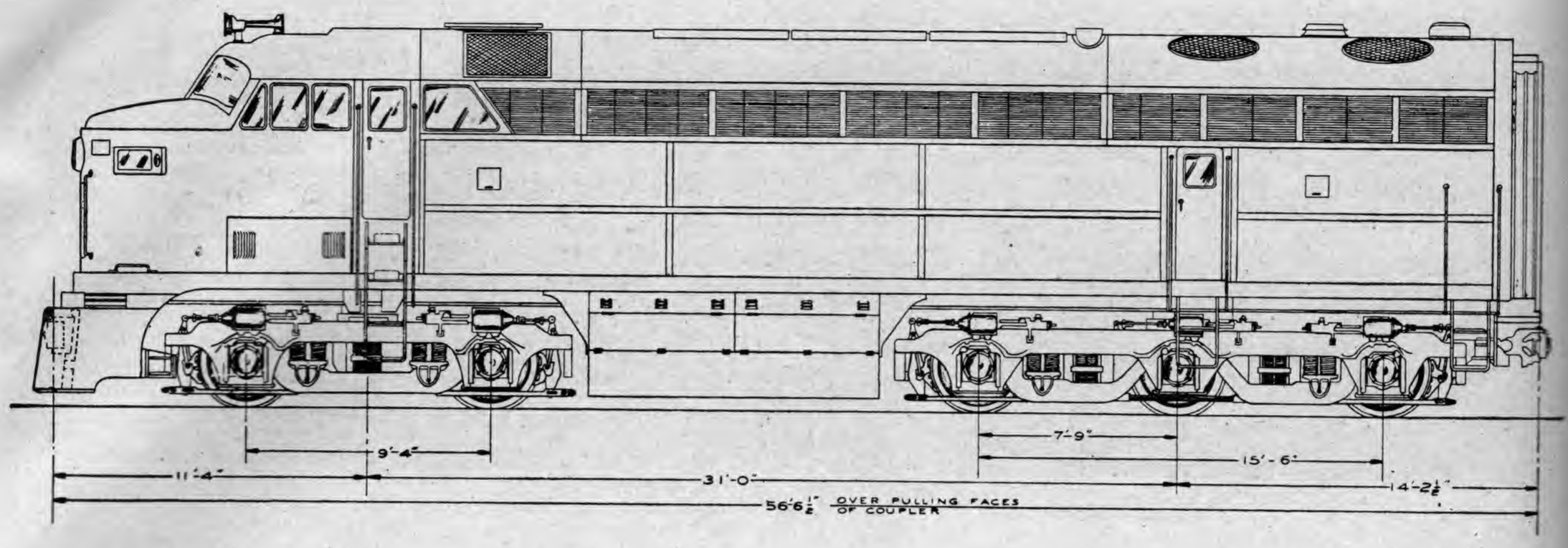
Fairbanks-Morse 2,000-hp. C-Line A unit. For B unit diagram see page 177.

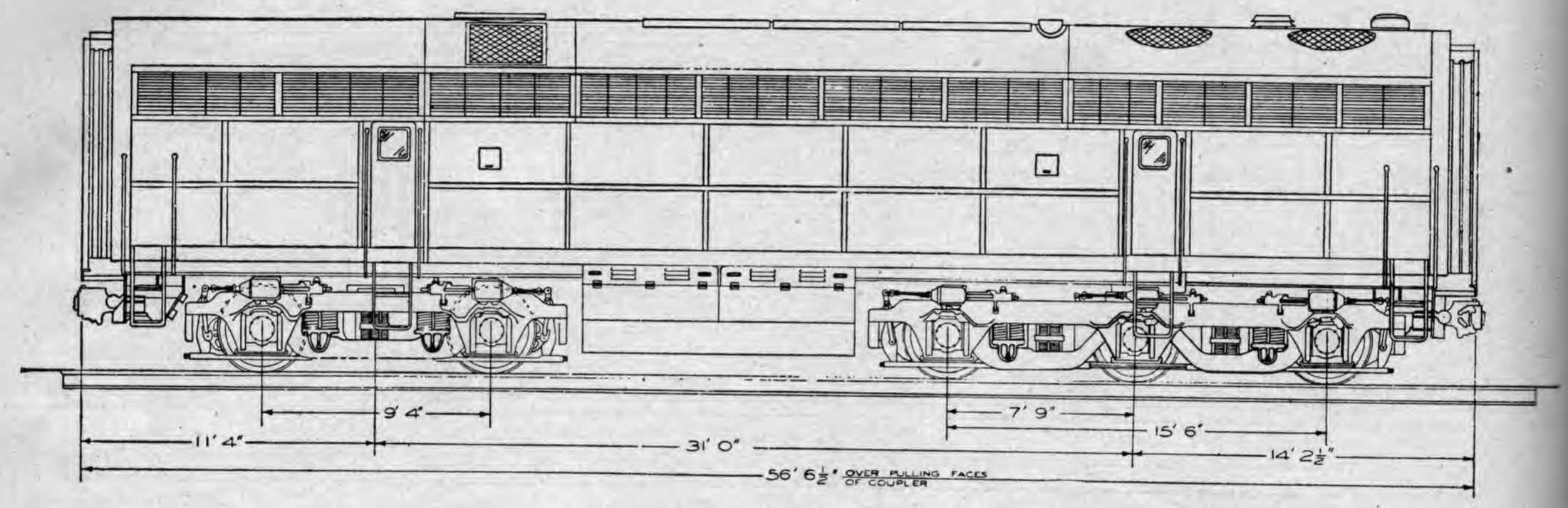


Fairbanks-Morse Consolidation-Line Freight Locomotives
General Characteristics, Weights and Dimensions

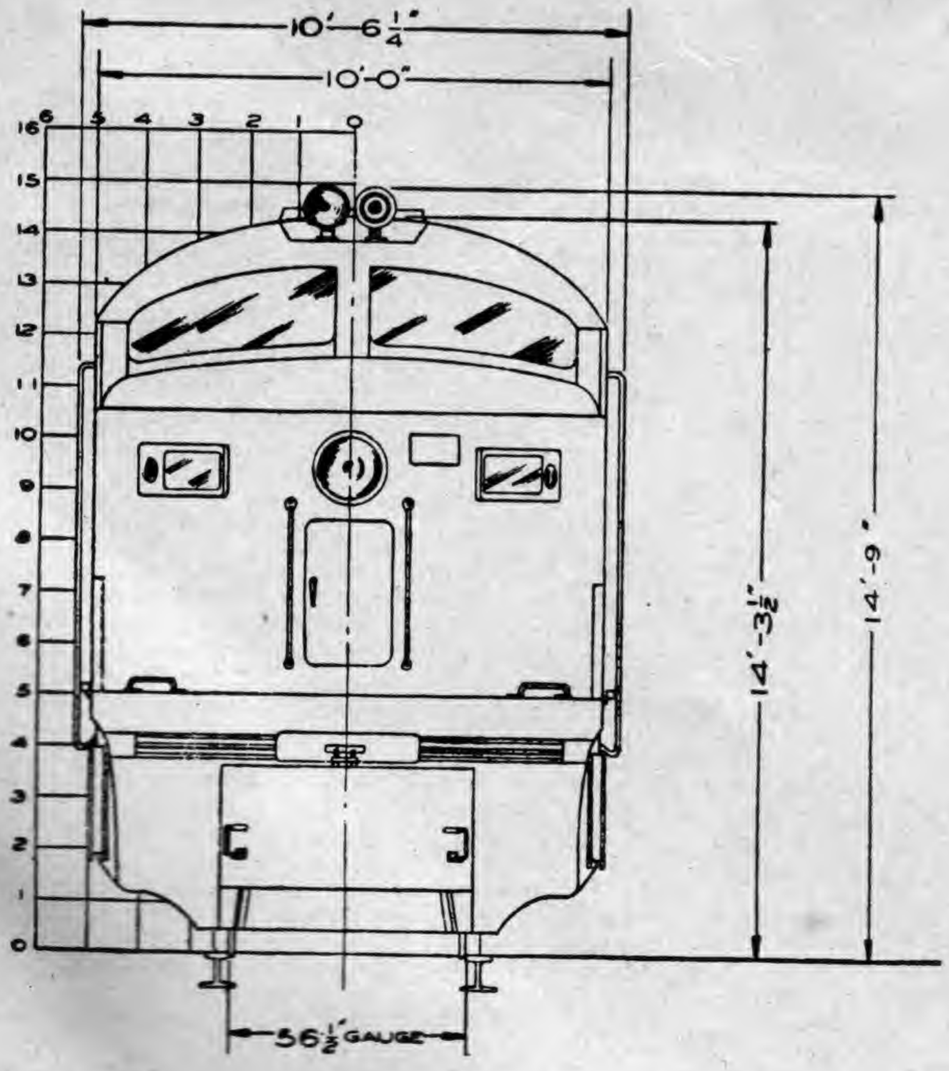
Model	CF16-4	CF20-4	CF24-4
Type:			
Whyte symbol	0-4-4-0	0-4-4-0	0-4-4-0
A.A.R. symbol	B-B	B-B	B-B
Engines:			
Number per unit	One	One	One
Type	8 cyl., 2 cycle opposed piston	10 cyl., 2 cycle, opposed piston	12 cyl., 2 cycle, opposed piston
Model			
Cylinders, bore and stroke, in.	8⅛ by 10	8⅛ by 10	8⅛ by 10
Horsepower available for traction	1,600	2000	2,400
Traction motors number	4	4	4
Journal bearings:			
Type	Roller	Roller	Roller
Size	6½ by 12	6½ by 12	6½ by 12
Wheels, diameter, in.	42	42	42
Wheel base, ft.-in.:			
Truck	9-4	9-4	9-4
Locomotive	43-4	43-4	43-4
Distance between truck centers, ft.-in.	34-0	34-0	34-0
Maximum dimensions, over-all, ft.-in.:			
Width	10-6	10-6	10-6
Height	15-0	15-0	15-0
Length over coupler pulling faces	56-6	56-6	56-6
Weights in working order, lb.:			
Locomotive, total, approx.	240,000	246,000	252,000
On drivers, approx.	240,000	246,000	252,000
Minimum radius curvature, deg.	21	21	21
Supplies (total capacity):			
Lubricating oil, gal.	300	350	400
Fuel oil, gal.	1,200	1,200	1,200
Engine cooling water, gal.	310	330	350
Train heating water, gal.			
Sand, cu. ft.	20	20	20
Air brake schedule	24-RL	24-RL	24-RL
Starting tractive force, lb. (30 per cent adhesion)	72,000	73,800	75,600
Gear ratio	68:15	63:15 62:17	60:19
Continuous rating, tractive force, lb.	52,500	48,600	42,20036,600
Maximum speed, m.p.h.	65	70 80	90

Fairbanks, Morse and Company

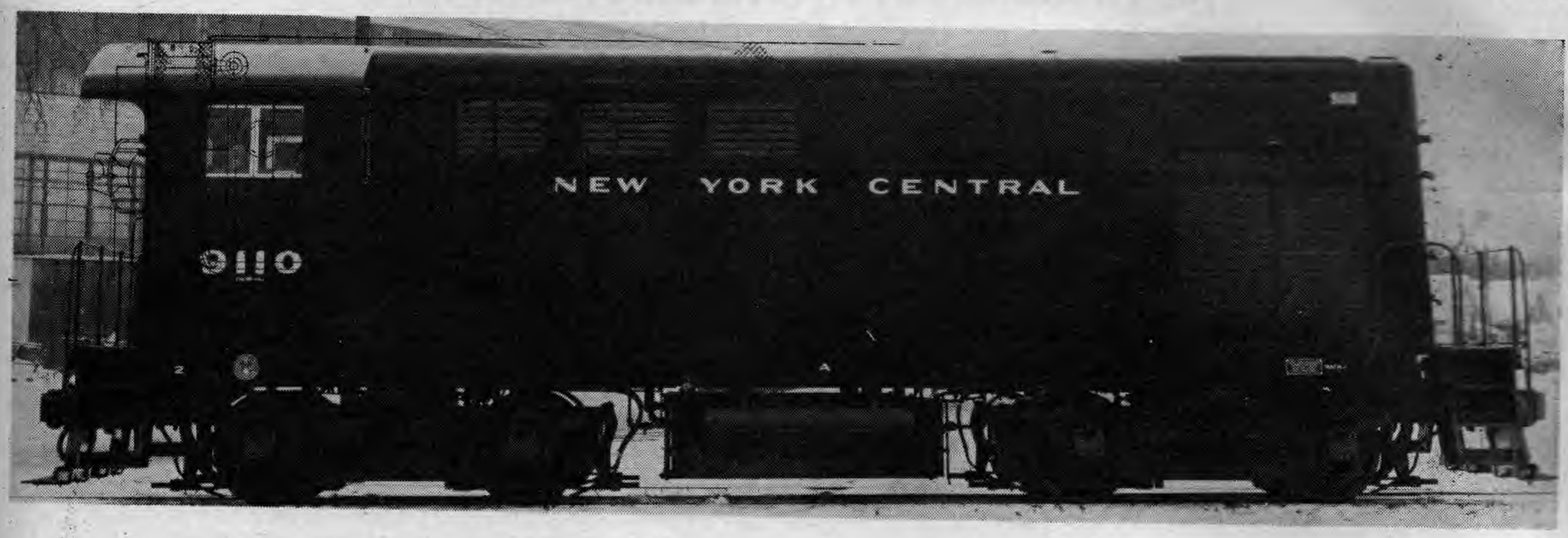




Above—A and B units of the Fairbanks-Morse 1,600-hp., 2,000-hp. and 2,400-hp. Consolidation-Line passenger locomotives. Below and right—Front end diagram and view of passenger locomotives.

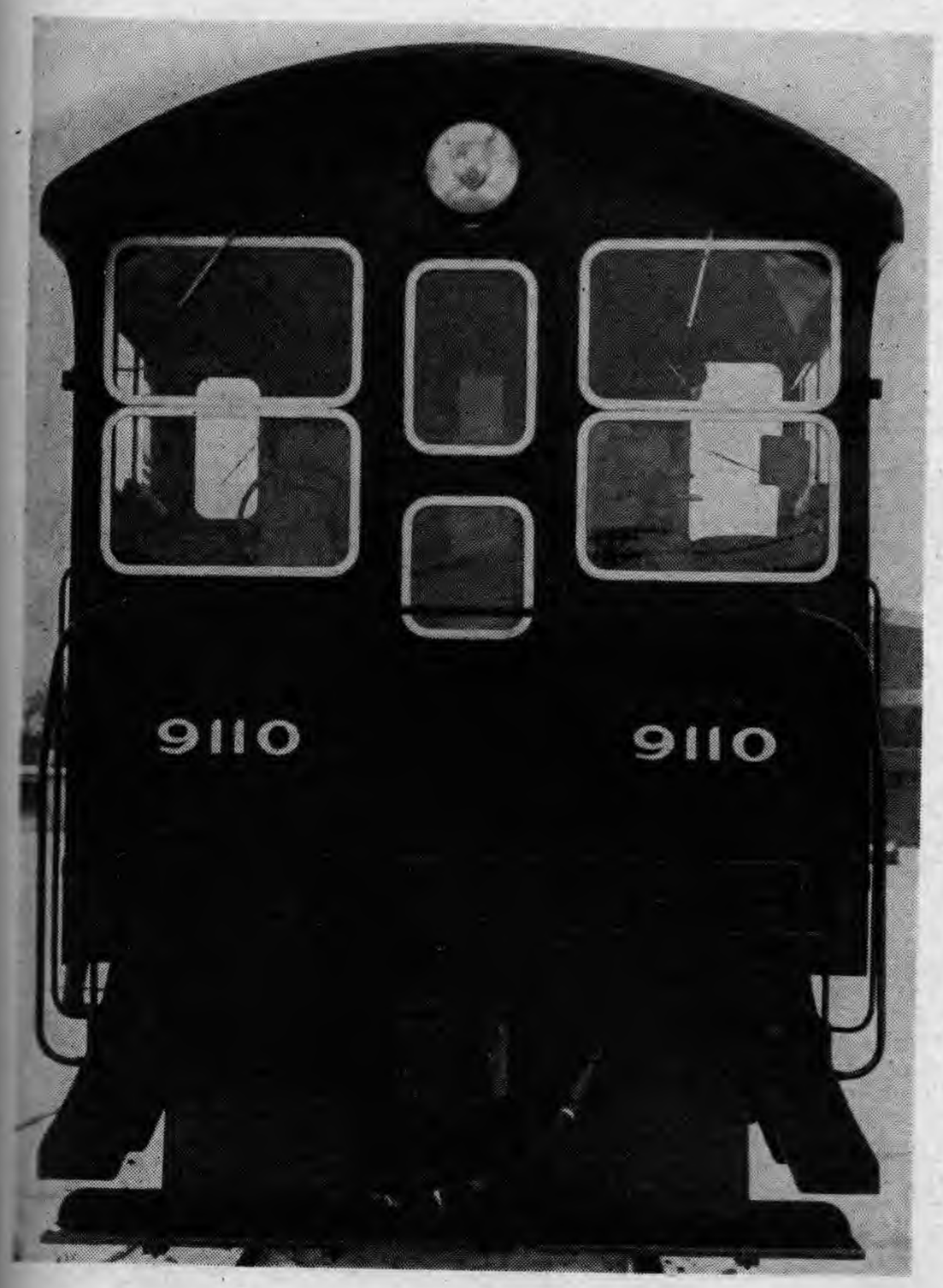


Fairbanks, Morse and Company

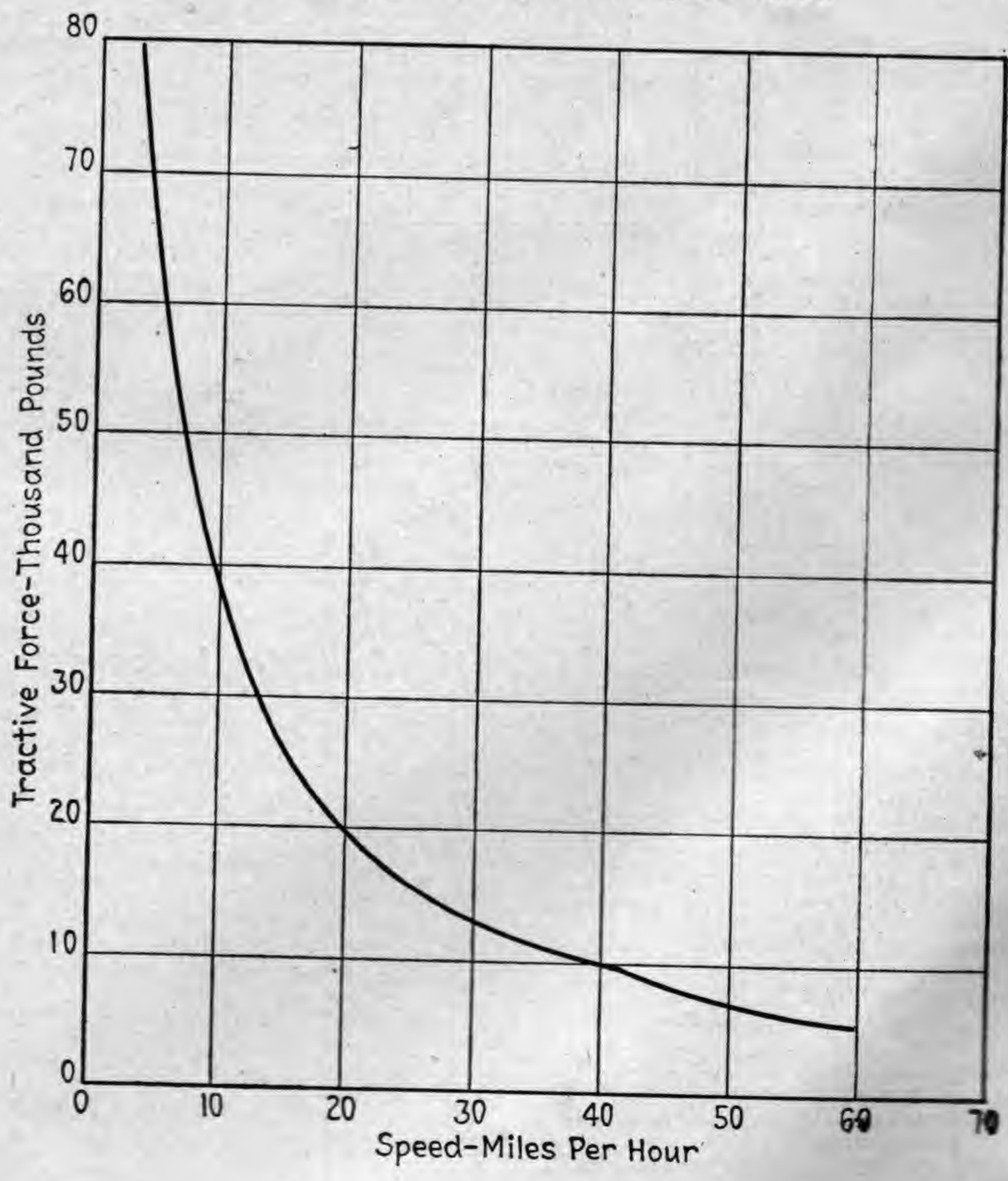


Partial List of Railroads Using Fairbanks-Morse 1,200-hp. Switching Locomotive H12-44

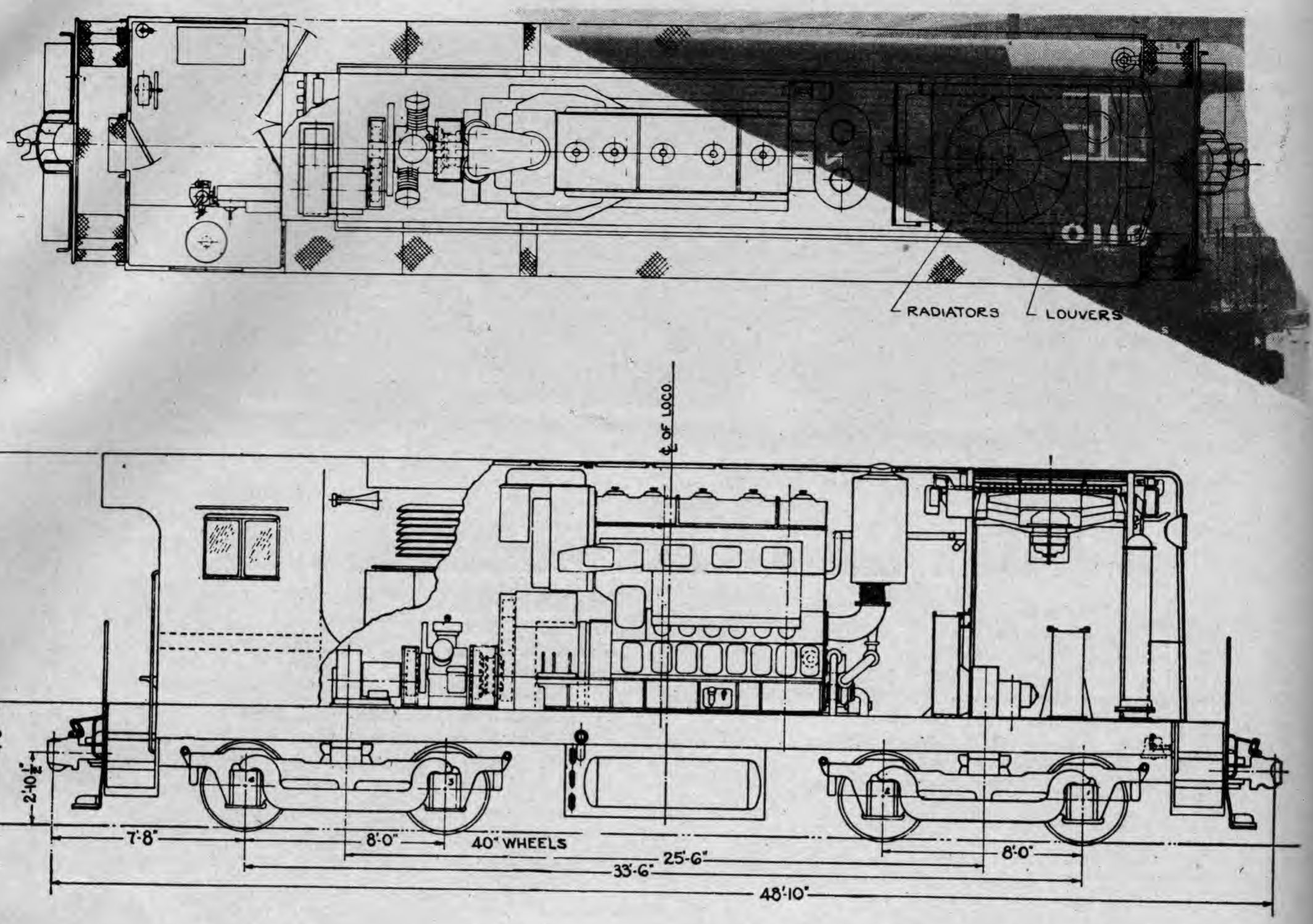
Apache
Atchison, Topeka & Santa Fe
Baltimore & Ohio
Chicago, Indianapolis & Louisville
Chicago, Milwaukee, St. Paul & Pacific
Chicago North Western
Denver & Rio Grande Western
Indianapolis Union
Kentucky & Indiana Terminal
Minnesota Western
New York Central
New York, Chicago & St. Louis (Nickel Plate)
Pennsylvania
St. Louis - San Francisco
Terminal Railroad Association of St. Louis
Union Pacific
Wabash

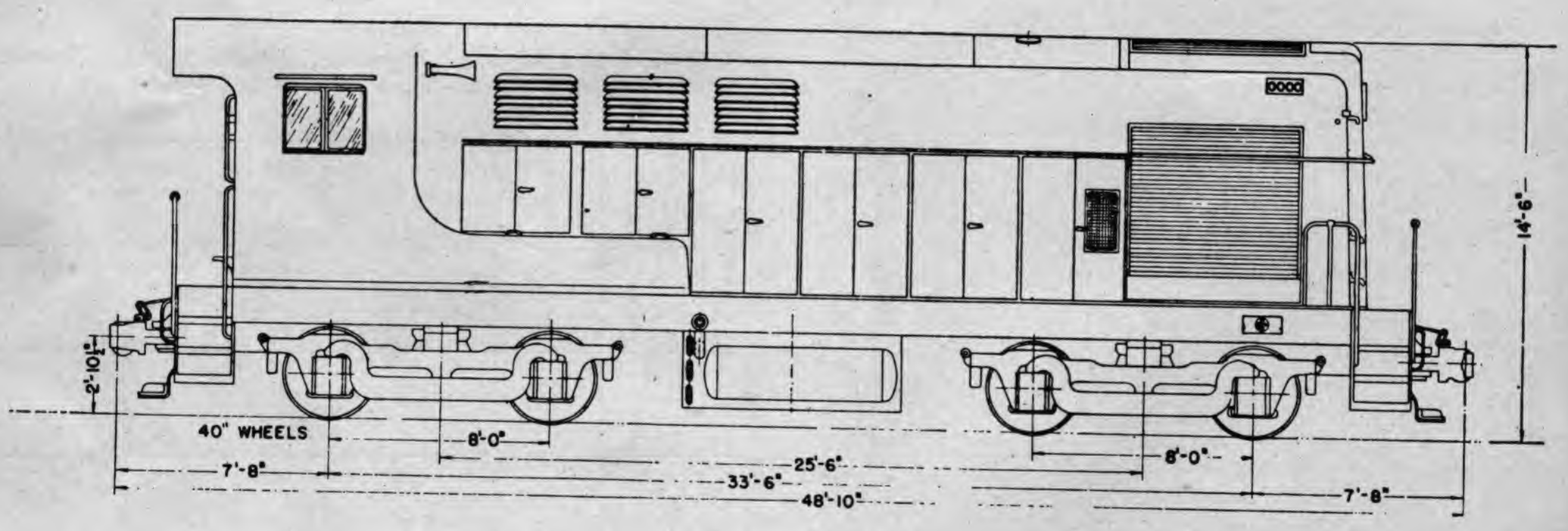


Left—End view of Fairbanks-Morse 1,200-hp. Switching Locomotive. Below—Tractive force-speed curve.



Fairbanks, Morse and Company





Fairbanks-Morse, 1,200-Hp. Switching Locomotive.

Model	H12-44
Type:	
Whyte symbol	0-4-4-0
A.A.R. symbol	B-B
Engines:	
Number per unit	One
Type	6 cyl., 2-cycle, opposed piston
Model	38D8⅛
Cylinders, bore and stroke, in.	8⅛ by 10
Horsepower for traction	1,200
Traction motors, number	4
Journal bearings:	
Type	Plain
Size	6½ by 12
Wheels, diameter, in.	40
Wheel base, ft.-in.:	
Truck	8-0
Locomotive	33-6
Distance between truck centers, ft.-in.	25-6

General Characteristics, Weights and Dimensions

Maximum dimensions, over-all, ft.-in.:	
Width	10-2
Height	14-6
Length over coupler pulling faces	48-10
Weights in working order, lb.:	
Locomotive, total, approx.	246,000
On drivers, approx.	246,000
Minimum radius curvature, deg. (with train)	29.5
Supplies (total capacity):	
Lubricating oil, gal.	250
Fuel oil, gal.	750
Engine cooling water, gal.	135
Sand, cu. ft.	28
Air brake schedule	6-SL
Gear ratio	68:14
Starting tractive force, lb. (30 per cent adhesion)	73,800
Continuous rating, tractive force, lb.	34,000
Maximum speed, m.p.h.	60

Fairbanks, Morse and Company

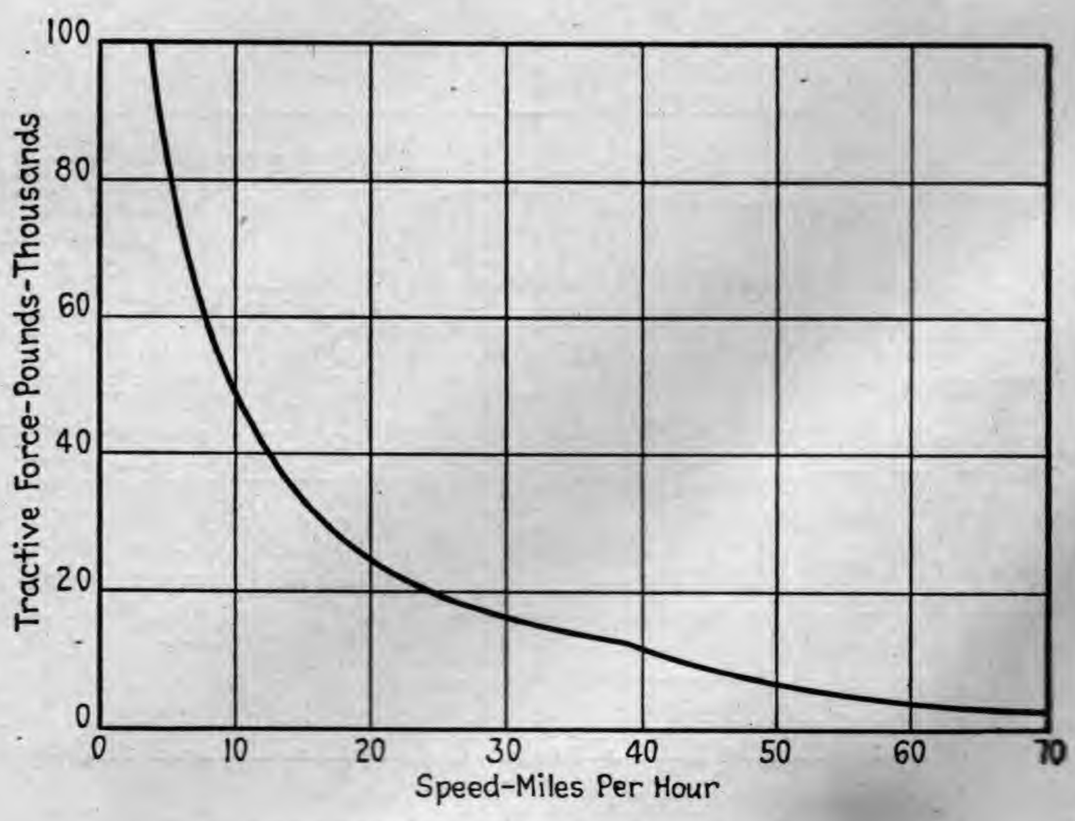
Fairbanks-Morse 1,600-Hp. All-purpose locomotive H 16-44

Fairbanks-Morse 1,600-Hp. All-Purpose Locomotives
General Characteristics, Weights and Dimensions

Model	H16-44				H16-64			H16-66		
Type:										
Whyte symbol	0-4-4-0				0-6-6-0			0-6-6-0		
A.A.R. symbol	B-B				AIA-AIA			C-C		
Engines:										
Number per unit	One				One			One		
Type	8 cyl., 2 cycle, opposed piston				8 cyl., 2 cycle, opposed piston			8 cyl, 2 cycle, opposed piston		
Model	38D8⅛				38D8⅛			38D8⅛		
Cylinders, bore and stroke, in.	8⅛ by 10				8⅛ by 10			8⅛ by 10		
Horsepower for traction	1,600				1,600			1,600		
Traction motors, number	4				4			6		
Journal bearings:										
Type	Plain				Plain			Plain		
Size	7 by 14				6½ by 12			6½ by 12		
Wheels, diameter, in.	42				42			42		
Wheelbase. ft.-in.:										
Truck	9-6				10-10			13-0		
Locomotive	39-6				40-10			42-3		
Distance between truck centers, ft.-in.	30-0				30-0			30-0		
Maximum dimensions, over-all, ft.-in.:										
Width	10-4				10-4			10-4		
Height	14-6				14-6			15-0		
Length over coupler pulling faces	54-0				55-8			55-8		
Weights in working order, lb.:										
Locomotive, total, approx.	240,000				252,000			300,000		
On drivers, approx.	240,000				168,000			300,000		
Minimum radius curvature, deg. (with train)	23				22			22		
Supplies (total capacity):										
Lubricating oil, gal.	300				300			300		
Fuel oil, gal.	900				800			800		
Engine cooling water, gal.	175				175			175		
Train heating water, gal.	740				740			740		
Sand, cu. ft.	28				28			28		
Air brake schedule	6-SL				6-SL			6-SL		
Starting tractive force, lb. (30 per cent adhesion)	72,000				50,400			90,000		
Gear ratio	68:15	63:15	62:17	60:19	68:15	63:15		68:15	63:15	
Continuous rating, tractive force, lb.	52,500	48,600	42,200	36,600	52,500	48,600		78,700	72,900	
Maximum speed, m.p.h.	65	70	80	90	65	70		65	70	

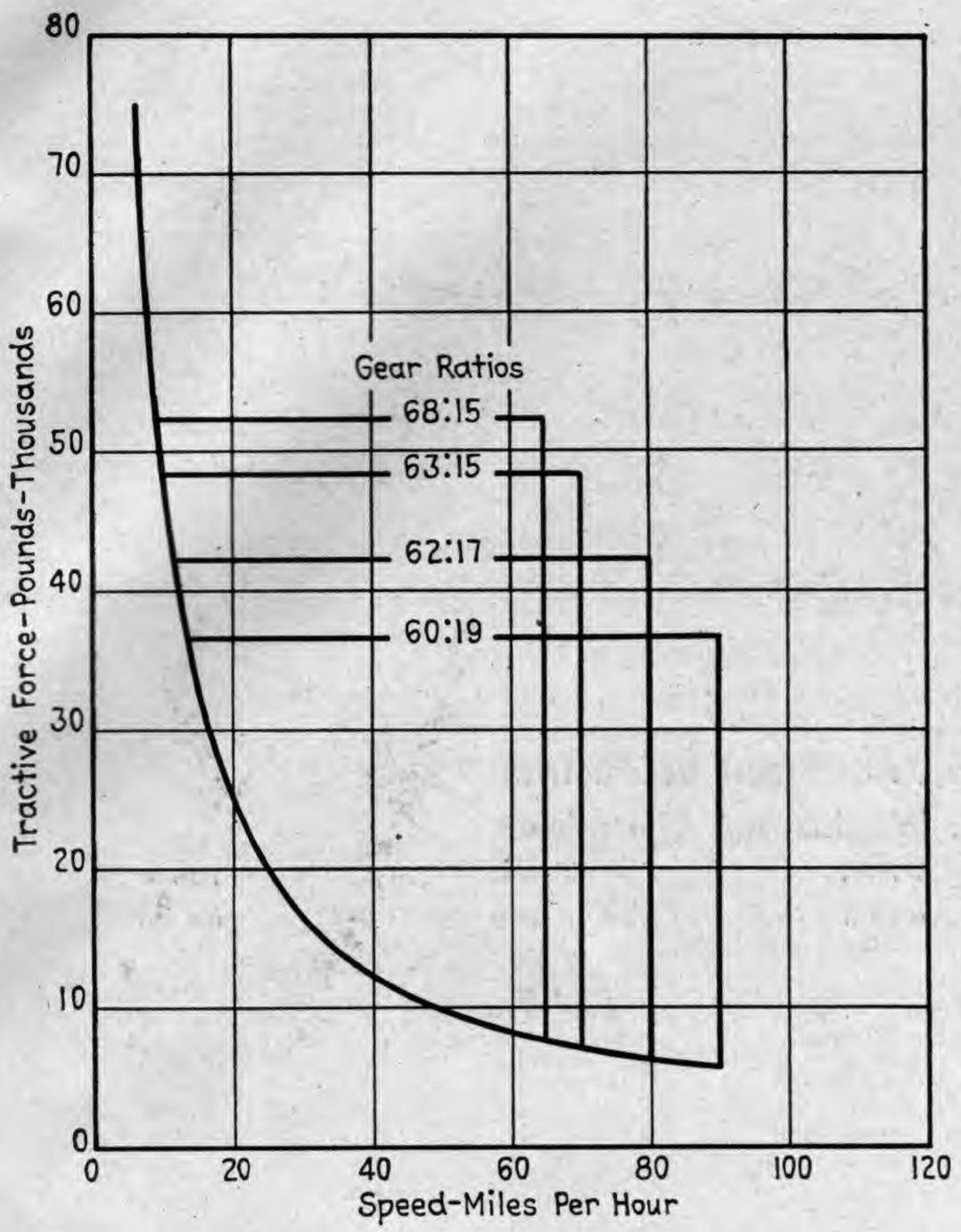
List of Railroads Using Fairbanks-Morse 1,600-Hp. All Purpose Locomotives

Akron, Canton & Youngstown
Atchison, Topeka & Santa Fe
Central of Georgia
Central Railroad of New Jersey
Chicago, Indianapolis & Louisville
Chicago North Western (6-Motor)
Chicago, Rock Island & Pacific
Denver & Rio Grande Western
Kansas City Southern
Long Island
Missouri-Kansas-Texas
New York, New Haven & Hartford
Southern
Union Pacific

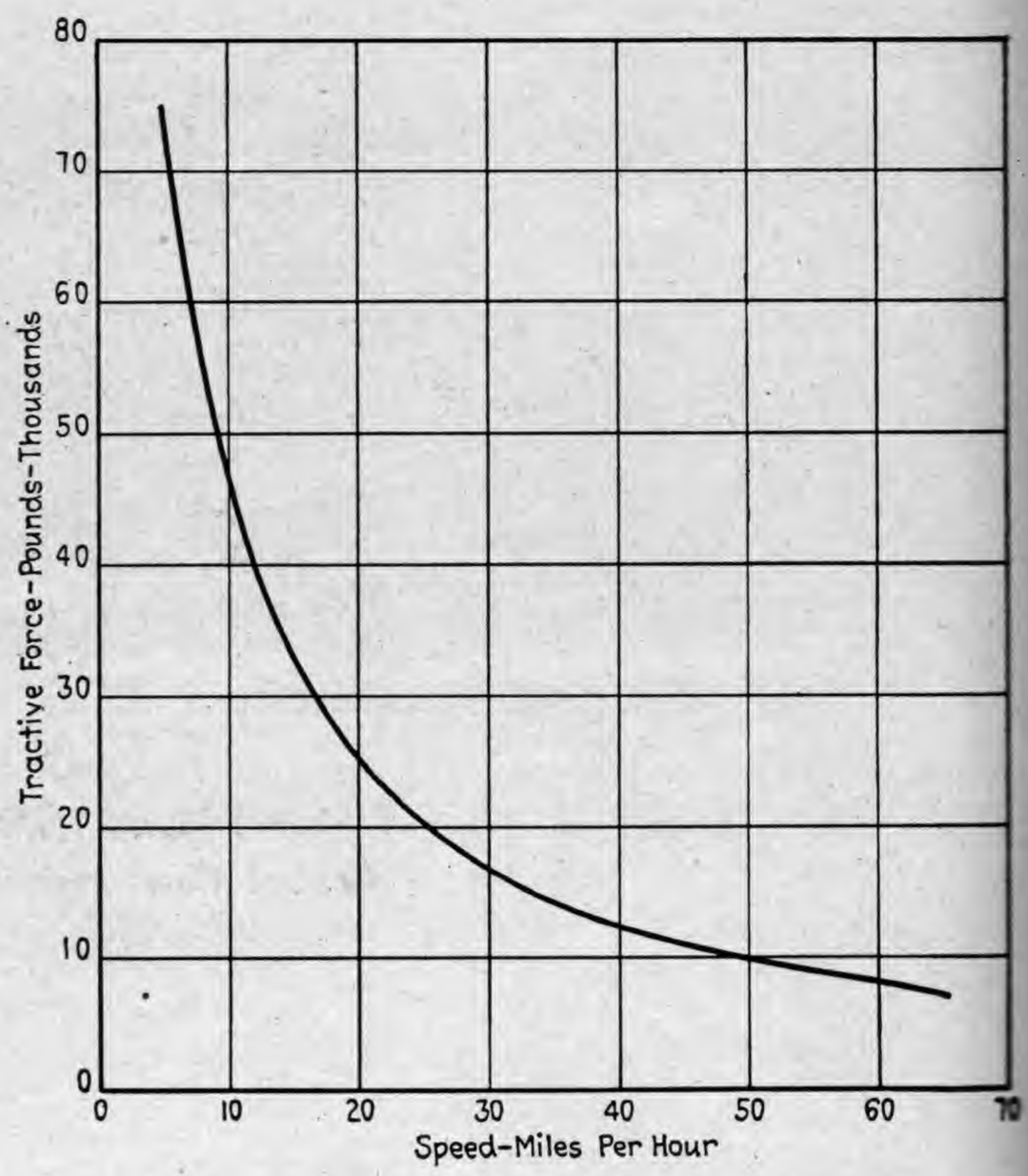


Tractive force curve (H 16-66 locomotive)

Fairbanks, Morse and Company

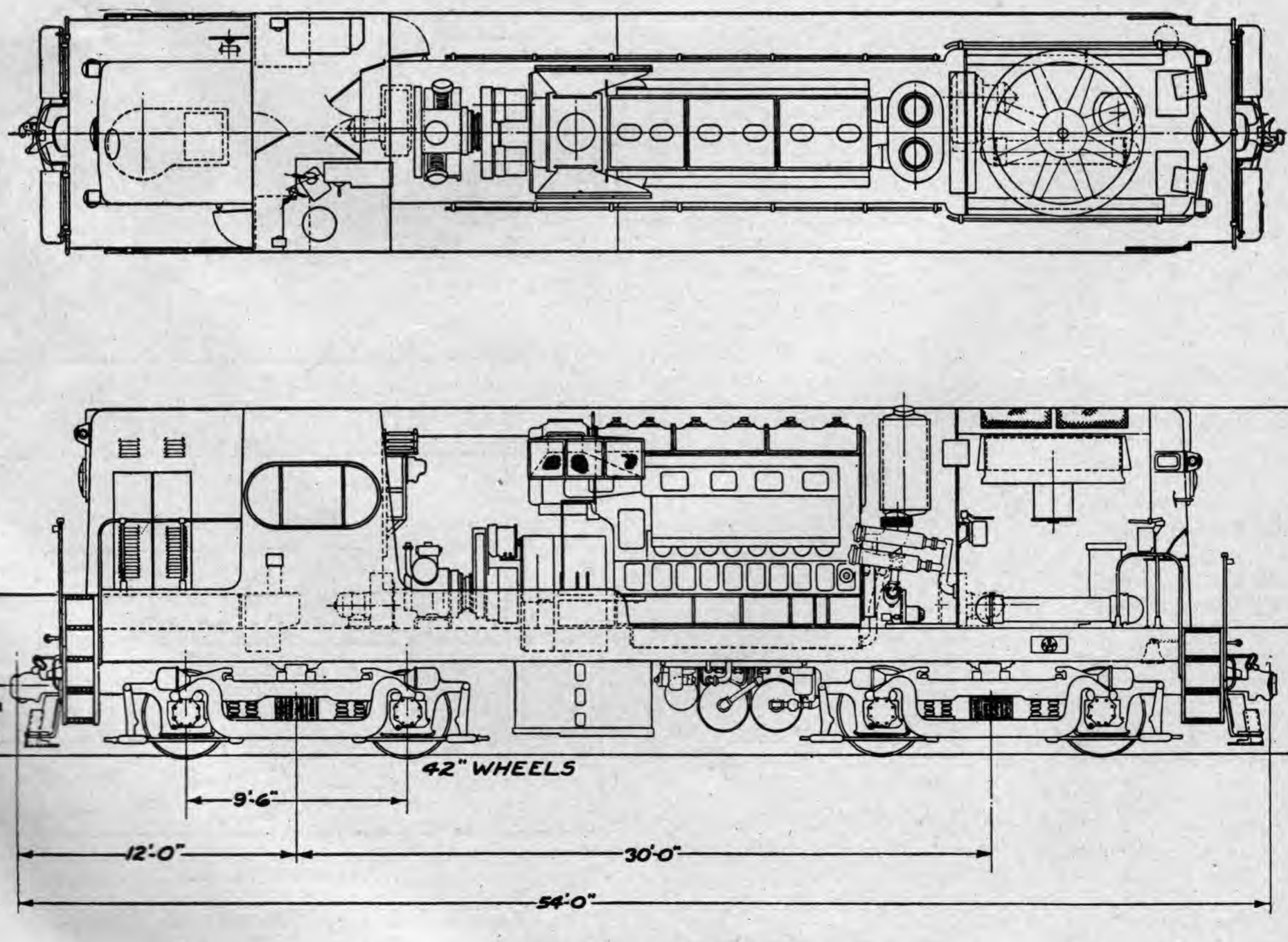


Tractive force curve (H 16-44 locomotive).



Tractive force curve (H 16-64 locomotive).

Below—Plan and elevation of Fairbanks-Morse 1,600 all-purpose locomotive H 16-44.

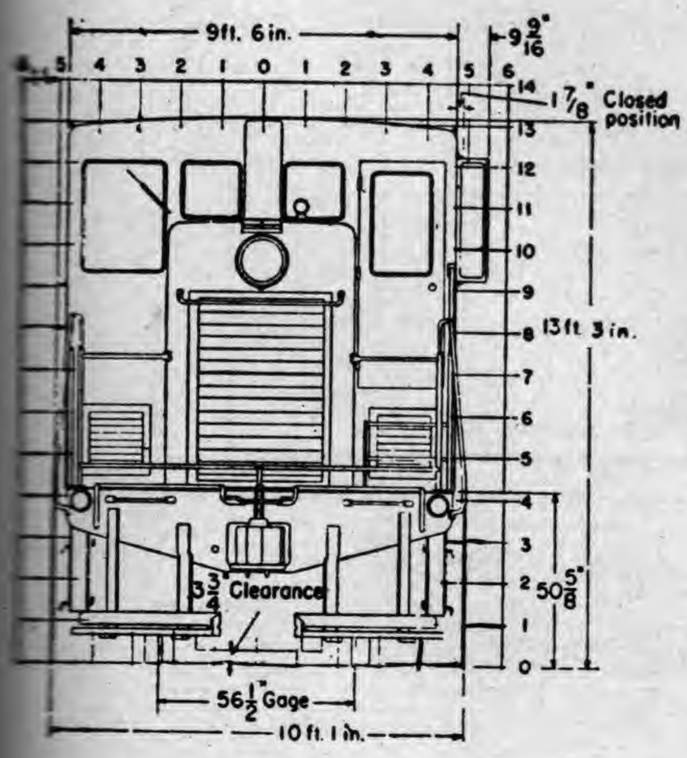


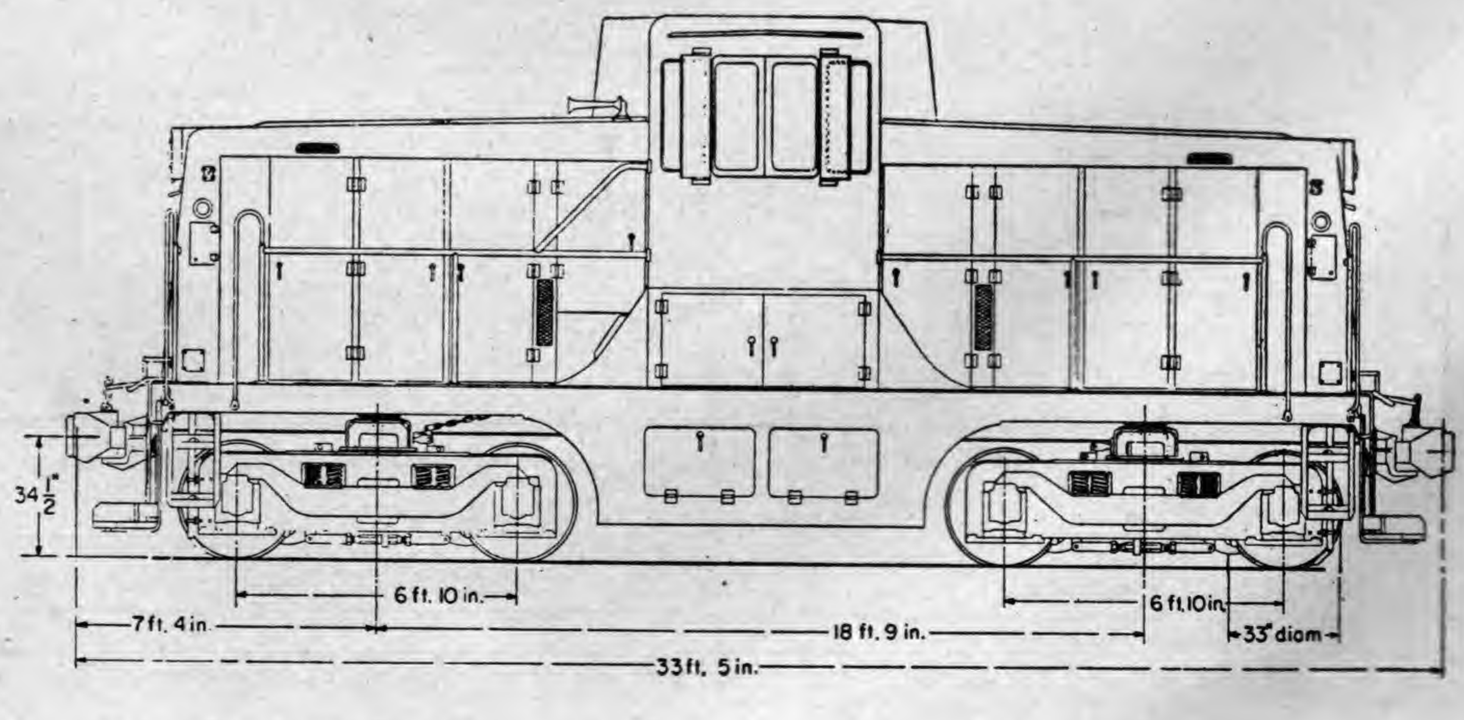
Fairbanks, Morse and Company

General Characteristics, Weights and Dimensions of the G.E. 44-Ton Diesel-Electric Locomotive for Yard and Road Service

Track, gauge, ft.-in.	4-8½
Wheel arrangement	0-4-4-0
No. of engines per cab	Two*
Horsepower available for traction	350
Journal bearings: Type	Friction
Size, in.	5 by 9
Wheels: Driving, pairs	Four
Idling, pairs	0
Diameter, in.	33
Wheel base: Truck, ft.-in.	6-10
Locomotive, between truck centers, ft.-in.	18-9
Underframe construction	Welded fabricated
Weights, in working order, lb.:	
Locomotive, total	89,000
On drivers	89,000
Light	86,000
Maximum overall dimensions, ft.-in.:	
Width	10-1
Height	13-3
Length, inside knuckles	33-5
Minimum radius curvature, with train	125 ft.
Supplies (total capacity):	
Lubricating oil, gal.	50
Fuel oil, gal.	250
Engine cooling water, gal.	40
Sand, cu. ft.	8
Air brake schedule	14-EL
Gear ratio	11.25:1
Continuous-rating t.f. lb.	13,000
Continuous-rating speed, m.p.h.	Seven
Maximum safe speed, m.p.h.	35
Starting tractive force (at 30 per cent adhesion), lb.	26,400

* Caterpillar.

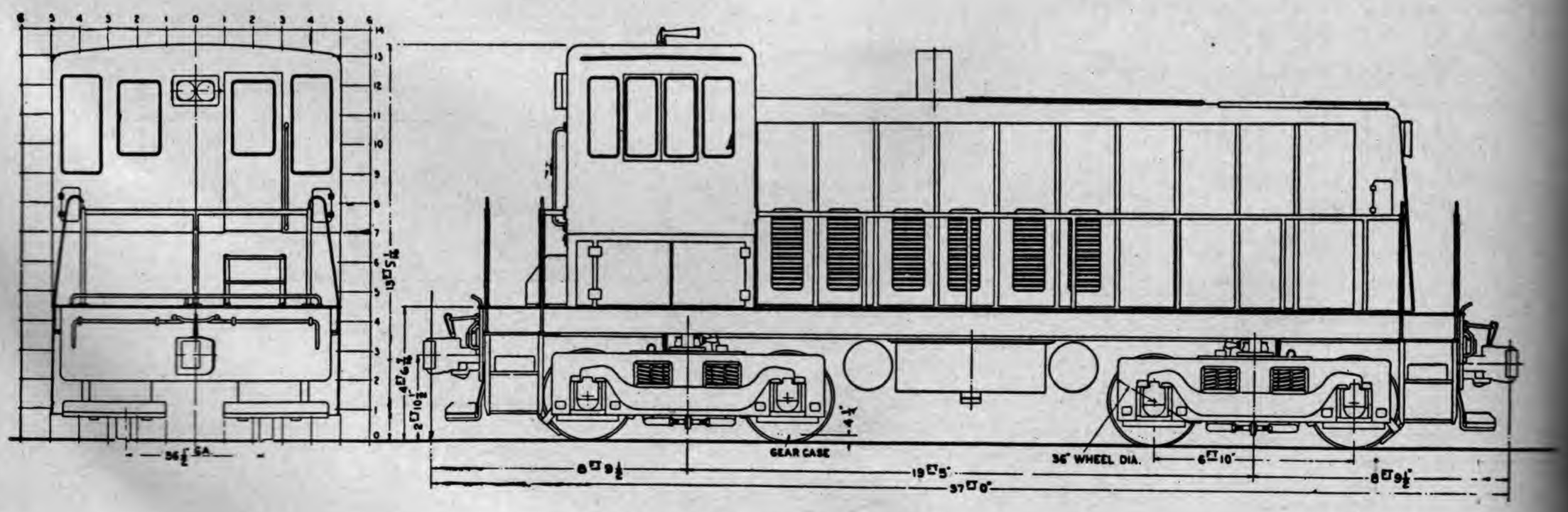




General Electric Company

General Characteristics, Weights and Dimensions of the G.E. 70-Ton Diesel-Electric Road Switching Locomotive

Track gauge, ft.-in.	4-8½
Wheel arrangement	0-4-4-0
No. of engines per cab	One
Horsepower available for traction	600
Journal bearings: Type	Friction
Size, in.	5½ by 10
Wheels: Driving, pairs	Four
Idling, pairs	0
Diameter, in.	36
Wheel base: Truck, ft.-in.	6-10
Locomotive, total, ft.-in.	26-3
Underframe construction	Welded
Weights, in working order, lb.:	
Locomotive, total	139,000
On drivers	139,000
Maximum overall dimensions, ft.-in.:	
Width	10-0
Height	13-5⅜
Length, inside knuckles	37-0
Minimum radius curvature, locomotive alone	75 ft.
Supplies (total capacity):	
Fuel oil, gal.	500
Lubricating oil, gal.	125
Engine cooling water, gal.	100
Sand, cu. ft.	12
Air brake schedule	14-EL
Gear ratio	105:15
Continuous-rating t.f. lb.	23,600
Continuous-rating speed, m.p.h.	8
Maximum safe speed, m.p.h.	55
Starting tractive force (at 30 per cent adhesion), lb.	41,700



General Electric Company

Electric Locomotives

THERE were 2,738 route miles (6,604 track miles) of electrified railroads in the United States and Canada as of Dec. 31, 1948. Most of the mileage lies in sections where traffic is dense. Motive power and electric rolling stock on the electrified lines consisted of 696 locomotives in October, 1950.

Systems

The distribution systems used consist of (1) an 11,000-volt, single-phase a.c. overhead catenary; (2) a d.c. overhead carrying 3,000, 2,400, 1,500, 1,200 or 600 volts, or (3) a 600-volt, third-rail system. These voltages are nominal. In some cases direct current is obtained either from a third rail or an overhead wire and in one instance—notably the New York, New Haven & Hartford—multiple-unit cars and locomotives are operated either from a 600-volt, third-rail or an 11,000-volt, 25-cycle, a.c. overhead system. With the adoption by the Great Northern, in 1927, of motor-generator type locomotives receiving power from an 11,000-volt a.c. contact system, the three-phase system employing two contact wires disappeared in the United States.

Locomotives

Electric locomotives can be divided into four general classifications.

1. Direct-current locomotives, in which current from the contact system is used directly by the motors through resistance control.

2. Alternating-current locomotives employing series a.c. motors; power from the contact system is supplied to a transformer on the locomotives and voltage to the motors is controlled by taps on the transformer.

3. Motor-generator type locomotives which receive power from an a.c. contact system and convert that power by means of a motor-generator set on the locomotive to direct current for the operation of d.c. series traction motors. Control is obtained by generator field excitation.

4. Locomotives having three-phase traction motors obtaining power from a single-phase contact system through the medium of a rotating phase splitter and a Scott-connected transformer.

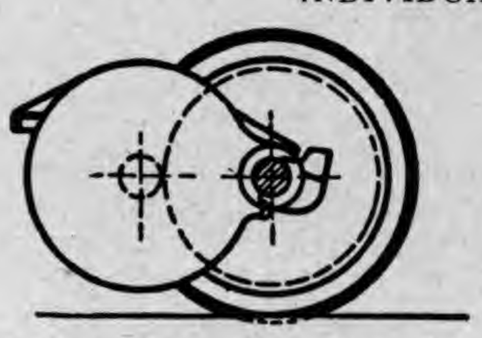
The systems used on extensions of existing systems or for new installations made during the past fifteen years have been limited to either the 11,000-volt system with series a.c. motors or the 3,000-volt direct-current system.

Straight battery locomotives find a limited application and, in several cases, railroads use two-or-three-power locomotives which can be operated from a contact system or a Diesel engine or a battery carried on the locomotive.

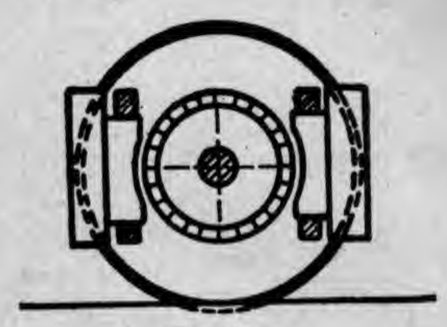
Drives

Drives used for electric locomotives may be classified either as individual or collective. In the case of collective drives, side rods are used to connect two or more driving wheels and these side rods in turn are driven by a main rod directly from the motor or from a jack shaft which is gear-driven by a motor or motors. Among the individual drives are the gearless type in which the traction motor is mounted directly on the axle between frame-mounted pole pieces, the geared quill type, described subsequeutly, and the nose-suspended motor drive

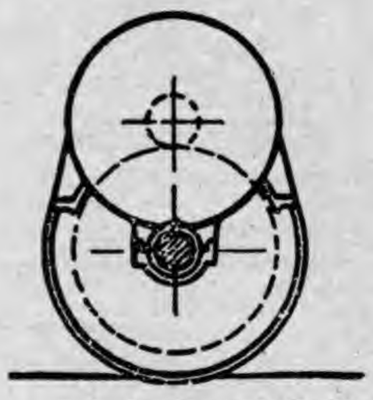
INDIVIDUAL DRIVES

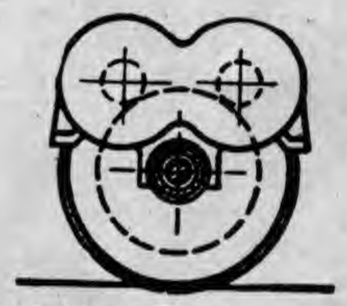


1—Axle Hung, Nose Suspended Motors. Single Reduction Gear.



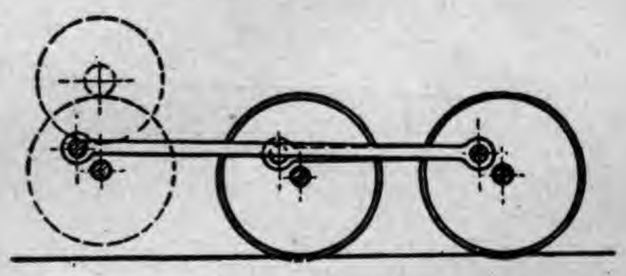
2—Gearless. Armature on Axle.





4, 5—Geared Quill, Motors and Quill on Frame.

COLLECTIVE DRIVES



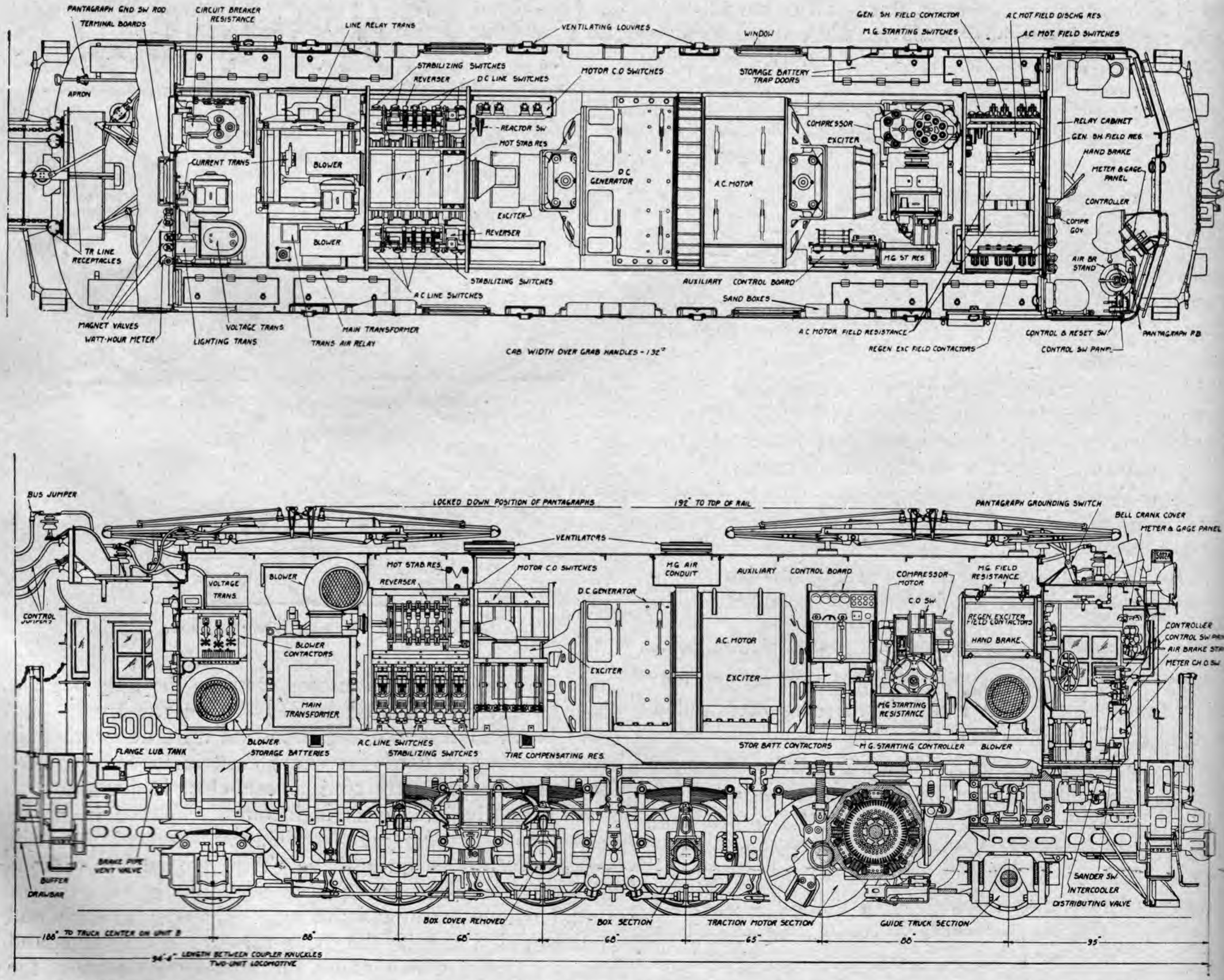
6—Geared Jack Shaft Side Rod Drive.

in which one end of the motor rests on the axle bearing and the other on a nose suspension on the truck. The drive is through a motor pinion and an axle gear. This type of drive is used for some electric locomotive and for multiple-unit cars and Diesel-electric locomotives.

All recently built electric locomotives have been designed with driving axles which are driven by a twin motor through a quill drive. The two motor pinions mesh with a single spur gear mounted at one end of a quill which surrounds the axle. A spider at each end of the quill transmits the drive through spring cups and wearing plates which allow for movement between the quill, which is carried in bearings in the twin motor, and the axle.

Great Northern 357.5-Ton Double-Unit Motor-Generator Type Electric Passenger and Freight Locomotive. Class 1-D-1 + 1-D-1. Built by The Baldwin Locomotive Works and Westinghouse Electric Corporation.

Eight 600-Volt D.C. Traction Motors. Weight on drivers, 274.8 tons. Total Length, 94 ft. 4 in. Diameter of driving wheels 56 in. Horsepower rating—hourly 4,330, continuous 3,660. Tractive force, lb.—start 137,400, max. 277,000, hourly 112,500, continuous 88,500. Speed, m.p.h.—max. 37.5, hourly 14.4, continuous 15.5.



Plan and Elevation of a Single Unit of the Great Northern Motor-Generator Type Electric Locomotive shown above. Built by The Baldwin Locomotive Works and Westinghouse Electric Corporation.

Pennsylvania Railroad 11,000 volt alternating current locomotive, 2-C + C-2, Class GG-1, for passenger service. Built by General Electric Company, Westinghouse Electric Corporation, The Baldwin Locomotive Works and Pennsylvania Railroad.

(Description: *Railway Age*, February 15, 1936)

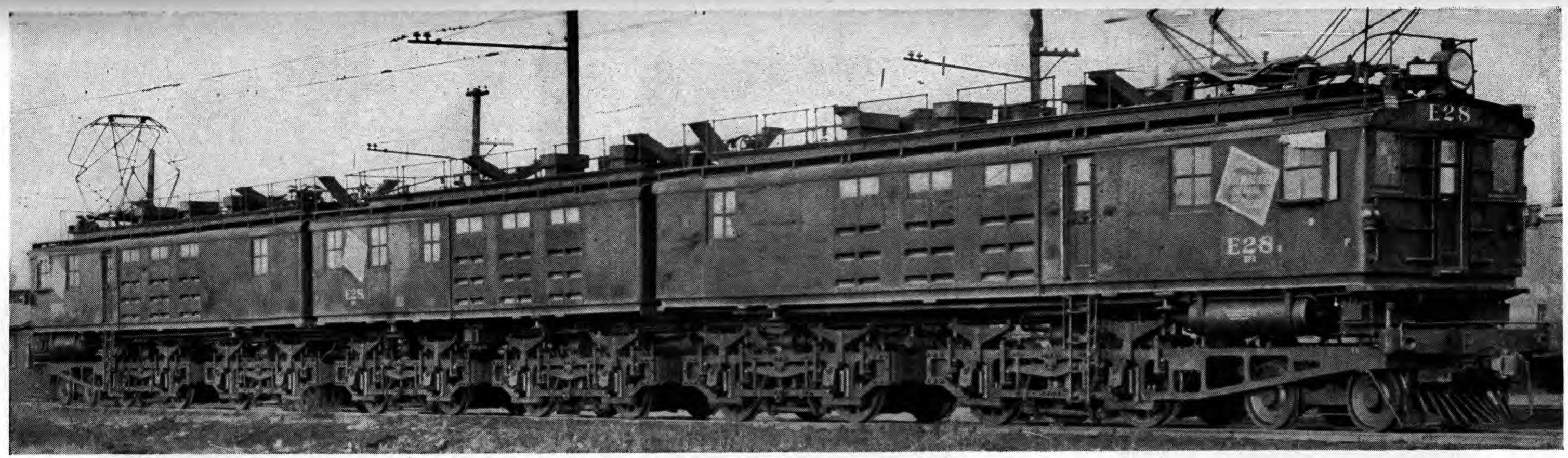
Engine truck wheel diameter	36 in.	Control, Master Type	Electro-pneumatic
Driving wheel diameter	57 in.	Weight on drivers	303,000 lb.
Rigid wheel base	13 ft. 8 in.	Total weight	477,000 lb.
Total wheel base	69 ft.	Rating continuous hp. at rail	4,620
Length—coupler faces	79 ft. 6 in.	Maximum starting tractive force, 25 per cent adhesion	70,700 lb.
Number of motors	12	Maximum speed	100 m.p.h.

Pennsylvania Railroad 11,000 Volt Alternating Current Locomotive 2-B-2, Class O-1-a, for Passenger Service. Total Weight 309,500 lb., Maximum Starting Tractive Force 33,500 lb.

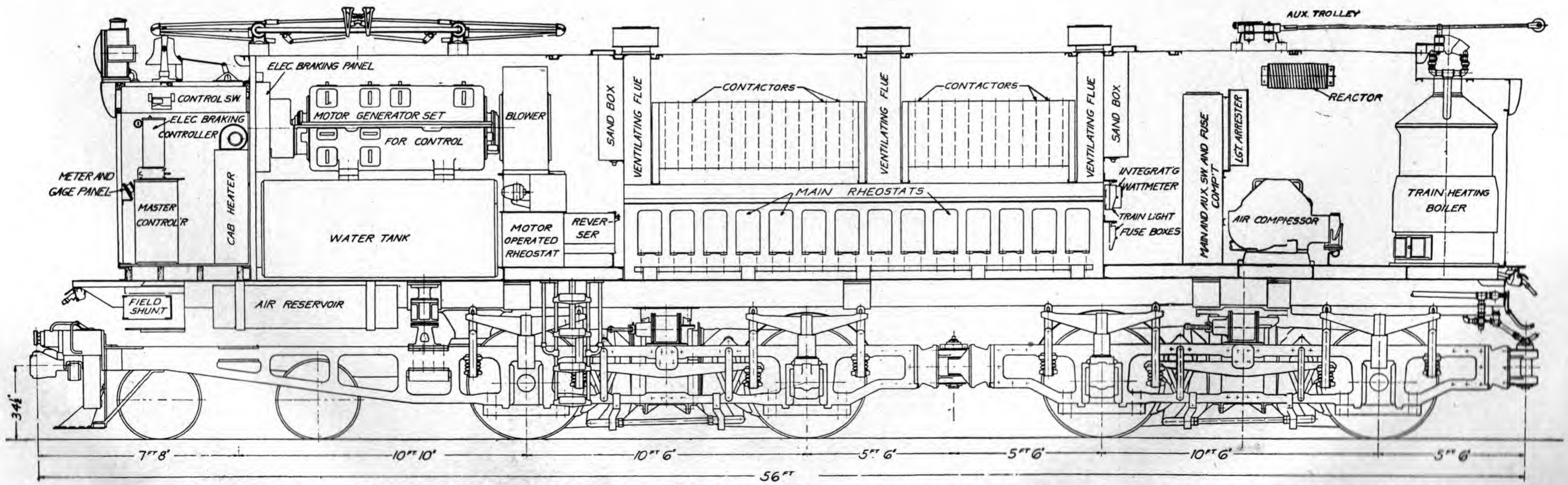
Cleveland Union Terminal Electric Locomotive for Passenger and Switching Service. Built by American Locomotive Company and General Electric Company. Weight 408,000 lb.; 3,000-Volt Direct Current; Six motors.

New York Central Electric Trailer for Diesel Pushers. Class DHT-1a operates on current drawn from Diesel-Electric Switchers.

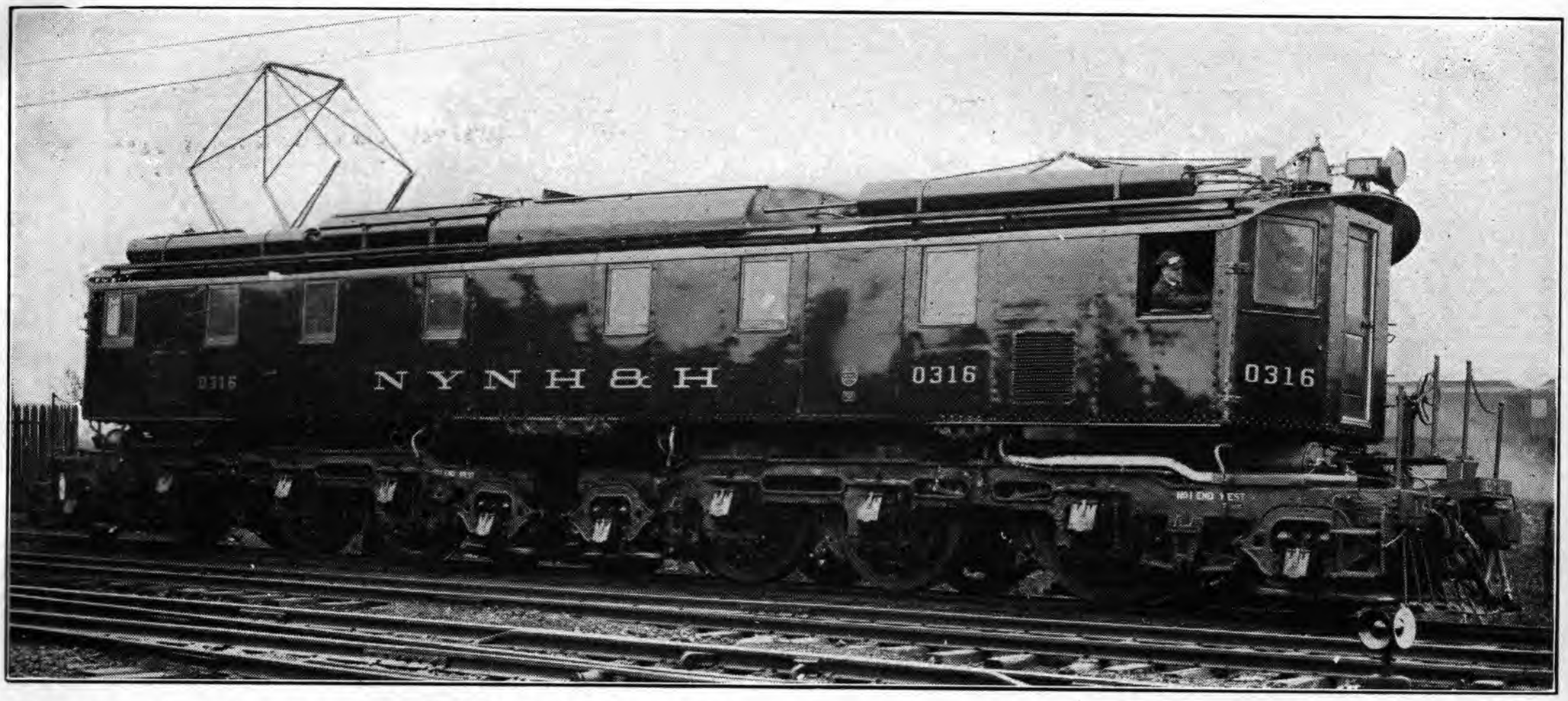
New York Central Freight Locomotive Class R-2. Built by American Locomotive Company and General Electric Company. Weight 266,400 l



Chicago, Milwaukee, St. Paul & Pacific Three-Unit Freight Locomotive, Road Class EF-3, Road Nos. E-25—E-33. 3,000-Volt Direct Current. Builder, General Electric Company.
Operated originally as a two-unit locomotive and later converted to a three-unit by addition of a center unit.
(For illustration as a two-unit locomotive see 1938 *Locomotive Cyclopedia, page* 907, *Fig.* 2013)

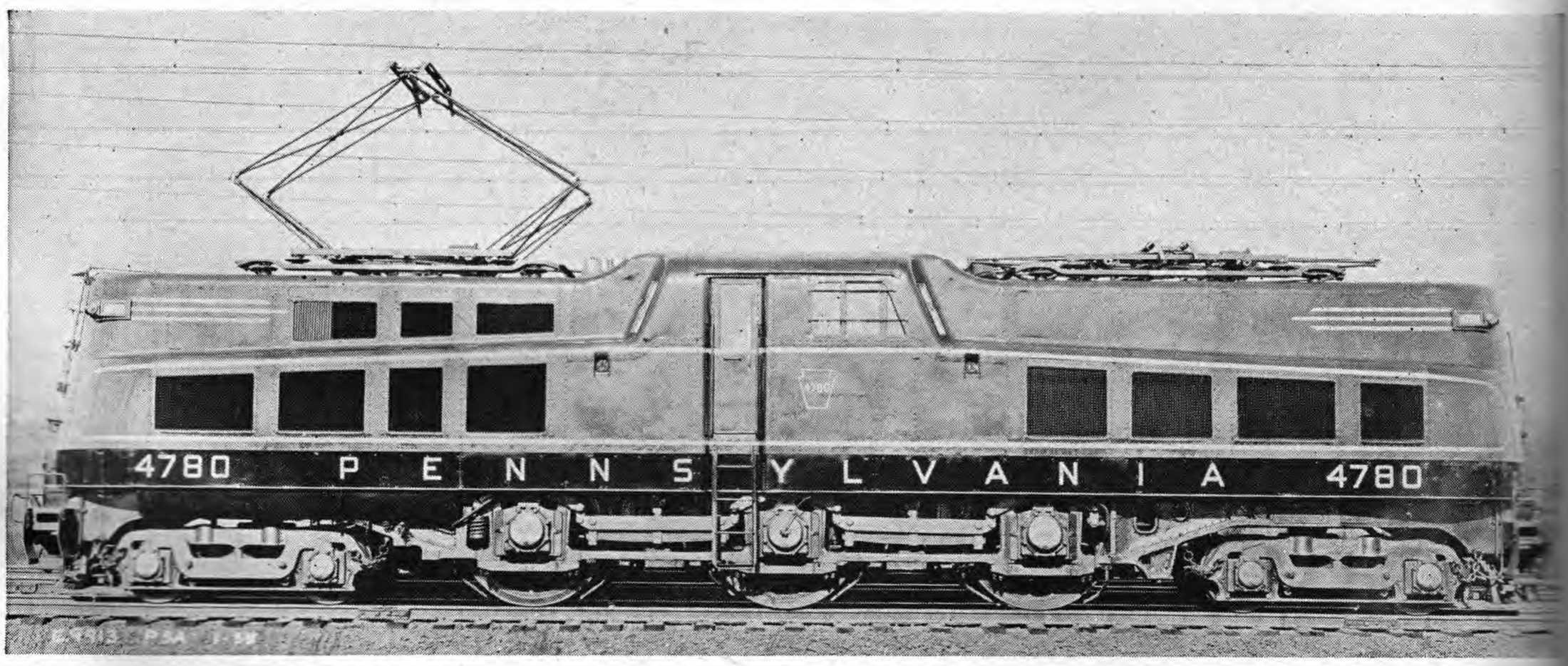


Elevation of End Unit showing location of apparatus for Chicago, Milwaukee, St. Paul & Pacific 3,000-Volt Direct Current Electric Freight Locomotive shown above.
General Electric Company

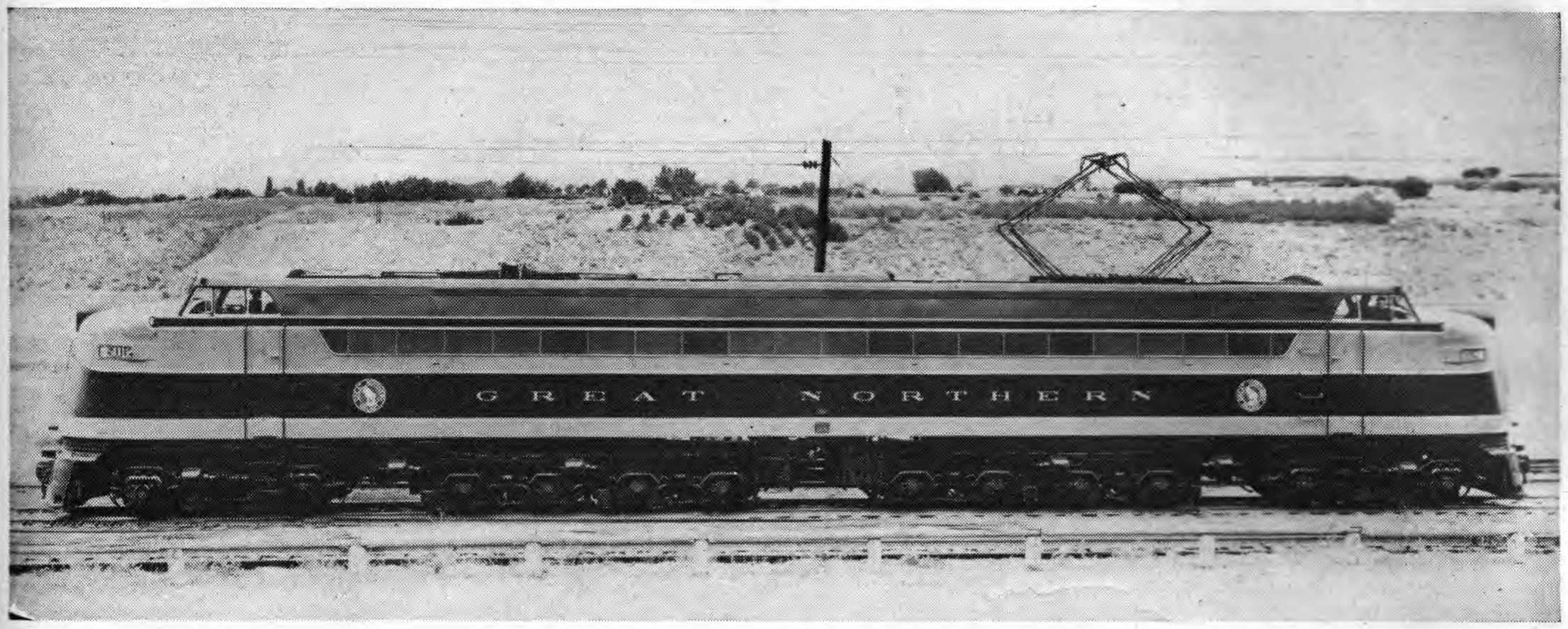


New York, New Haven & Hartford 11,000-volt, 25-cycle, alternating current passenger locomotive EP-2, Road Nos. 0300-0326. Class 1-C-1 + 1-C-1. Built by Westinghouse Electric Corporation and The Baldwin Locomotive Works.

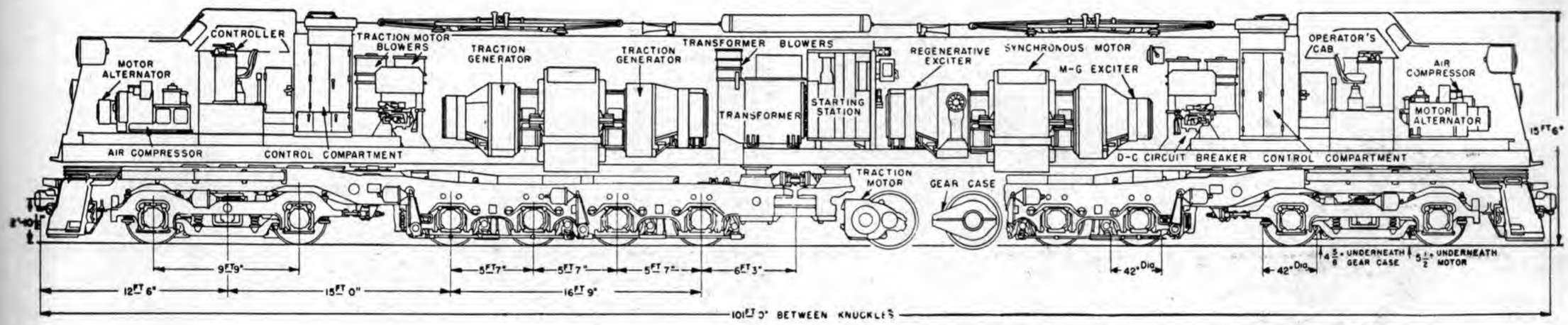
New York, New Haven & Hartford Electric Passenger Locomotive, Class EP-4, Road Nos. 0361-0366. Combination 11,000-Volt A.C. Overhead and 600-Volt D.C. Third Rail. Weight, 432,000 lb.



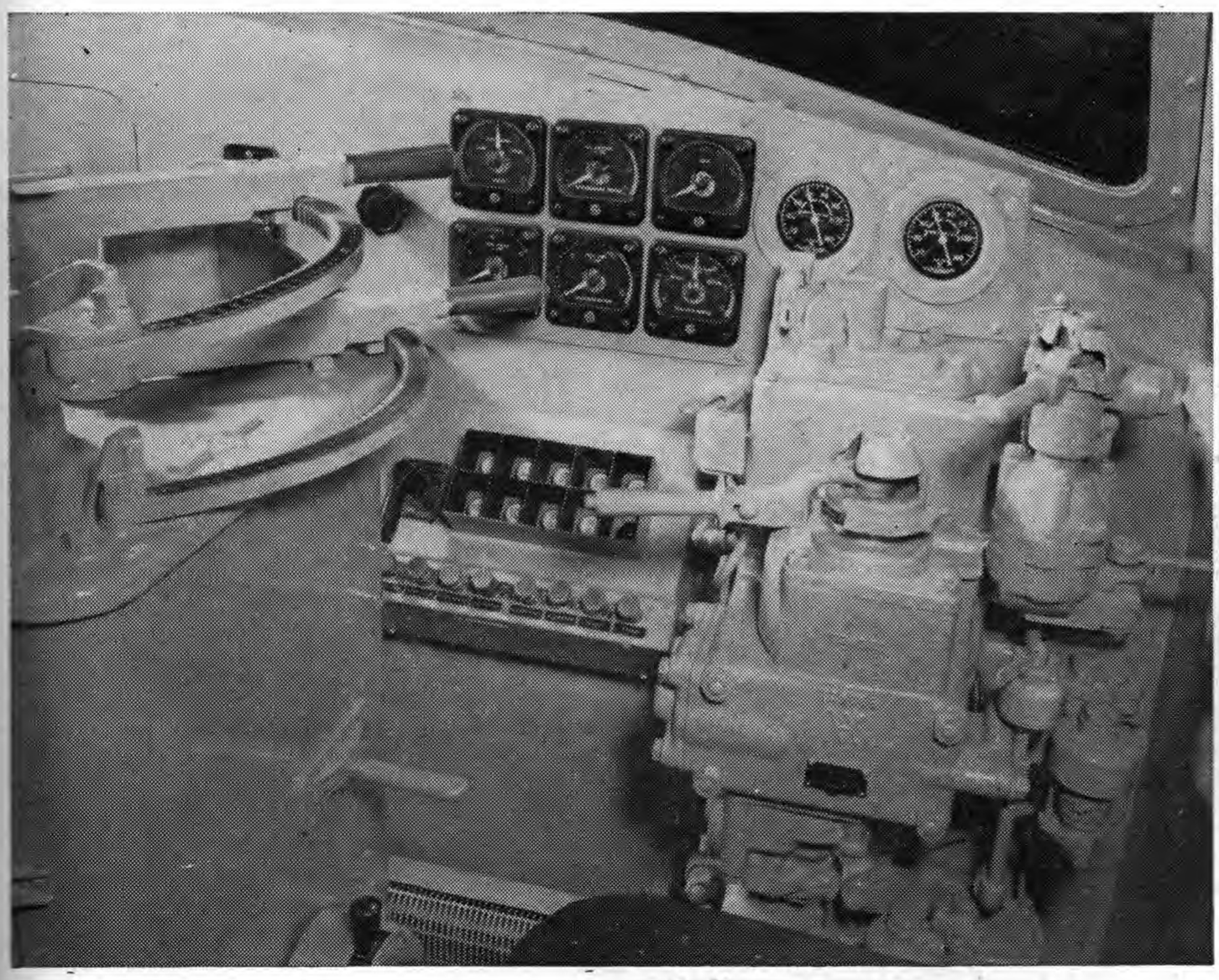
Pennsylvania 11,000-volt alternating current locomotive, 2-C-2, Class P5a, for passenger service. Built by General Electric Co., Westinghouse Electric Corporation and Pennsylvania Railroad. Total weight, 394,000 lb.; weight on drivers, 229,000 lb.; maximum tractive force, 57,250 lb.; continuous horsepower at rail, 3750; length, 62 ft. 8 in.; total wheel base, 49 ft. 10 in.; maximum speed 70 m.p.h.



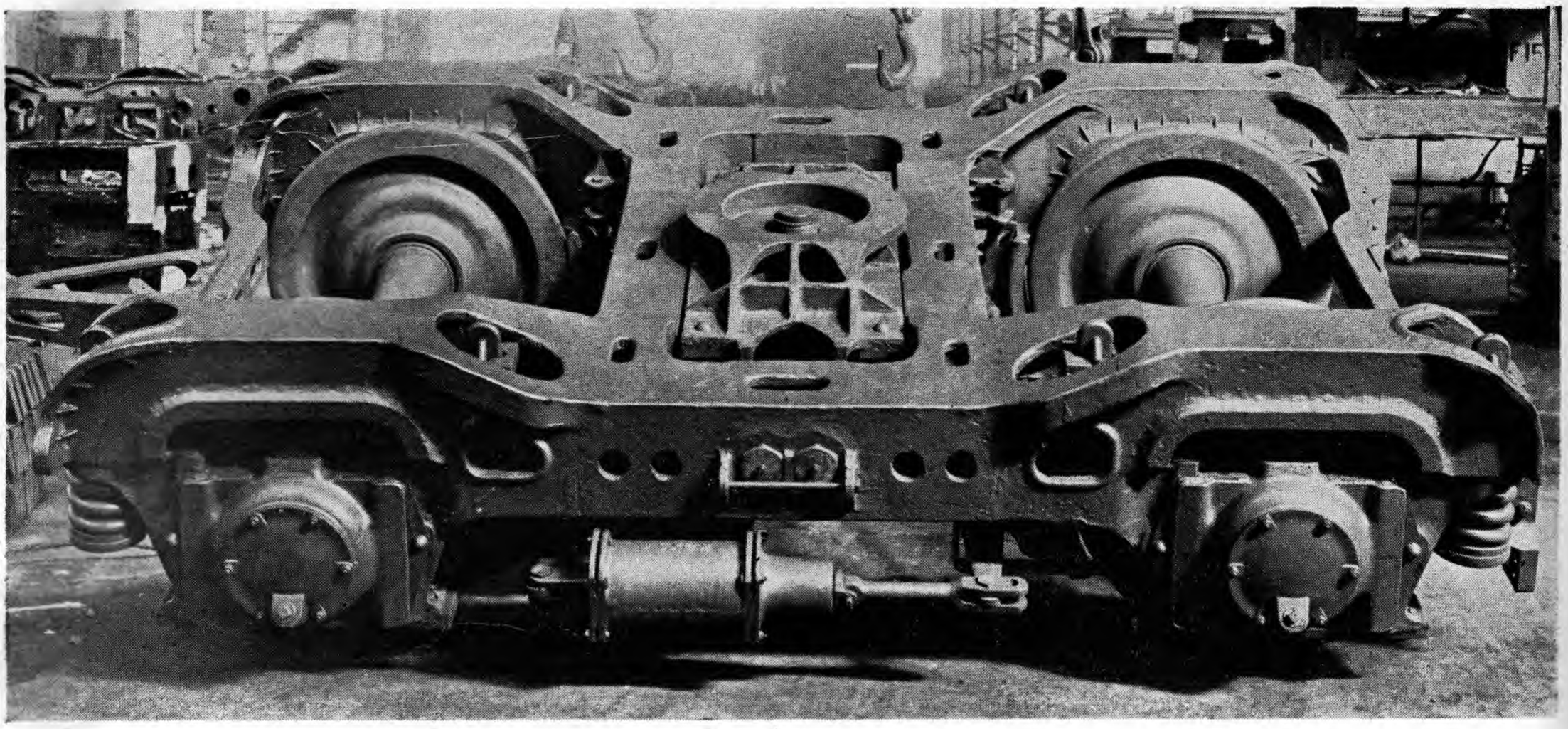
Great Northern Single Cab, Motor-generator Locomotive, Built by General Electric Company. Total weight 720,000 lb. 11,000-volt, 25 cycle, single phase 5,000 hp. 119,000 lb. tractive force. Class B-D + D-B with all axles motorized.



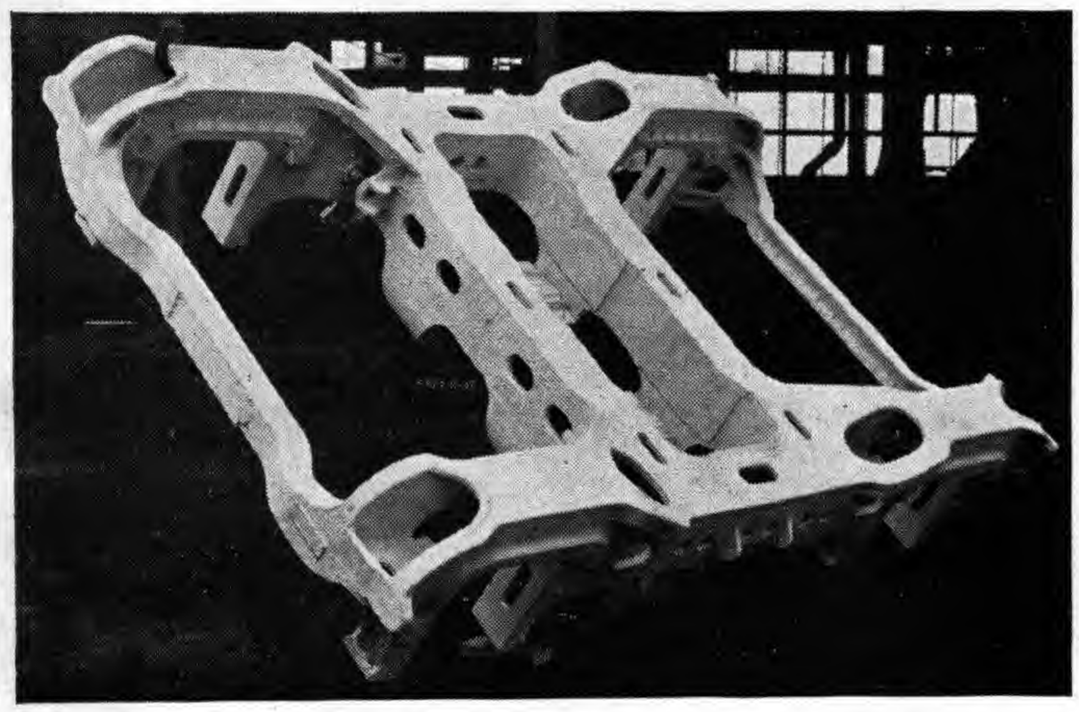
Above—Elevation of Great Northern Locomotive showing the layout of equipment.



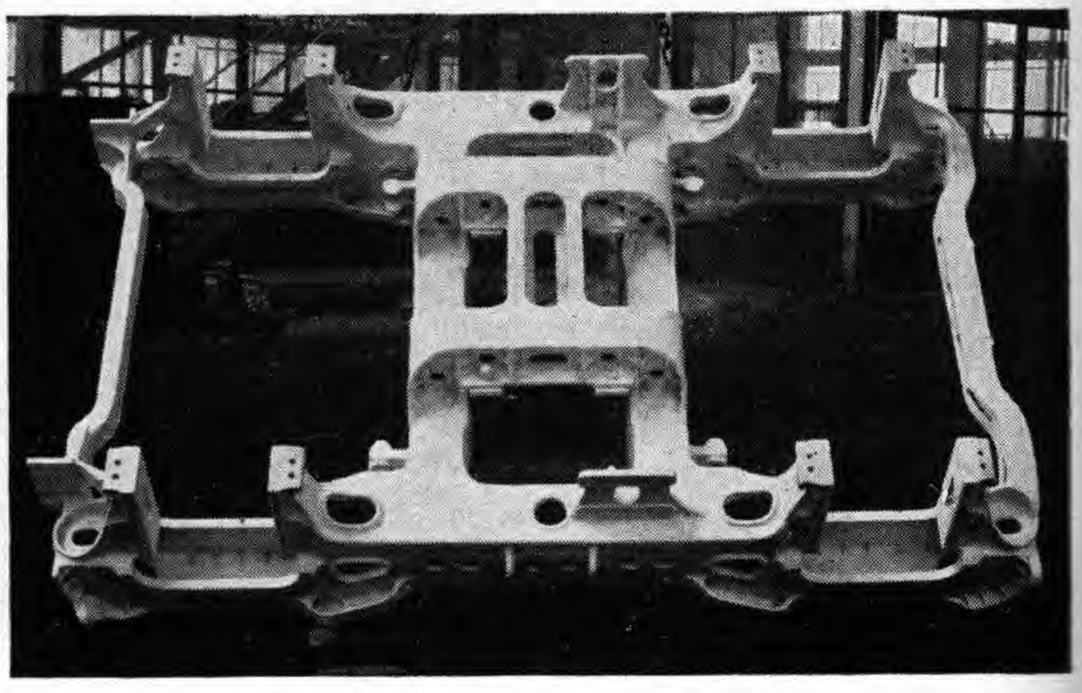
Left—Control position in the cab of Great Northern Locomotive.



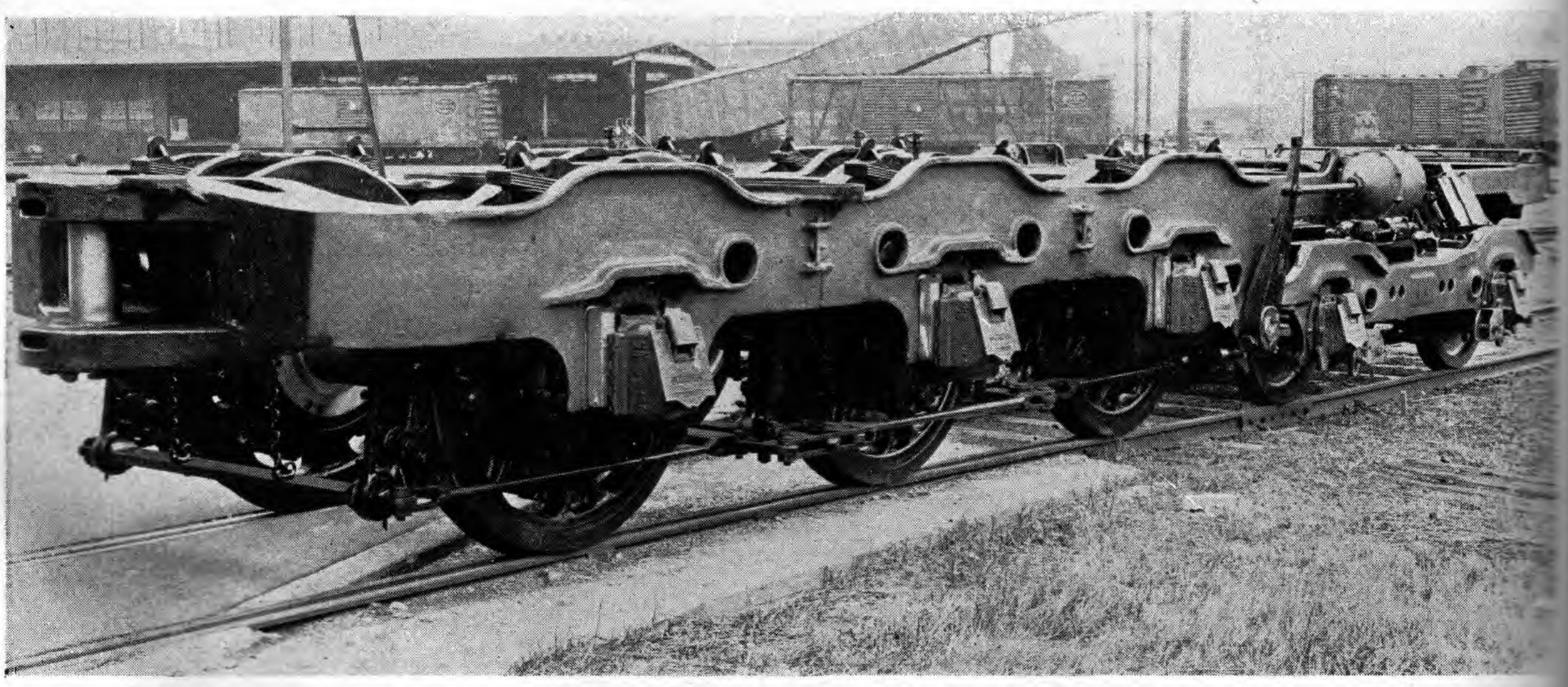
Commonwealth cast steel four-wheel guiding truck for Pennsylvania Railroad Class GG-1 electric locomotive.



Top view of Commonwealth cast steel truck frame for truck shown above.



Bottom view of Commonwealth cast steel truck frame for truck shown above.



Commonwealth one-piece cast steel driving truck bed and Commonwealthguiding truck for New York, New Haven & Hartford electric locomotives.

General Steel Castings Corporation

Turbine Locomotives

THE FIRST SERIOUS DISCUSSION of the gas turbine as a prime mover for American railway motive power was in a report presented before the Railway Fuel and Traveling Engineers' Association in 1939 by a committee of which the late L. P. Michael, mechanical engineer of the Chicago & North Western, was chairman. The reports of this committee were presented over a period of several years[1].

The first actual applications of turbines to locomotive use in America were steam. The General Electric Company's locomotive was a turbine-electric drive and included a condenser. The Westinghouse Electric Company developed a steam turbine with gear transmission which was applied to an otherwise essentially conventional Pennsylvania steam locomotive, built by Baldwin Locomotive Works, and a steam-turbine power plant with electric transmission for two Chesapeake & Ohio locomotives, also built by Baldwin. These locomotives operated non-condensing. The problem of providing adequate condenser capacity within locomotive space limitations is difficult of solution; without the condenser the steam turbine offers no appreciable advantage in fuel economy over the reciprocating steam engine.

Five gas-turbine-electric locomotive projects are now current. One locomotive is in service, another is nearly ready for road tests and the others are in various stages of design development.

The Alco-GE 4,500-hp. Single-Cab Experimental Gas-Turbine-Electric Locomotive[2] was placed in service early in 1949. In July of that year it went to the Union Pacific and has been operating in revenue freight service.

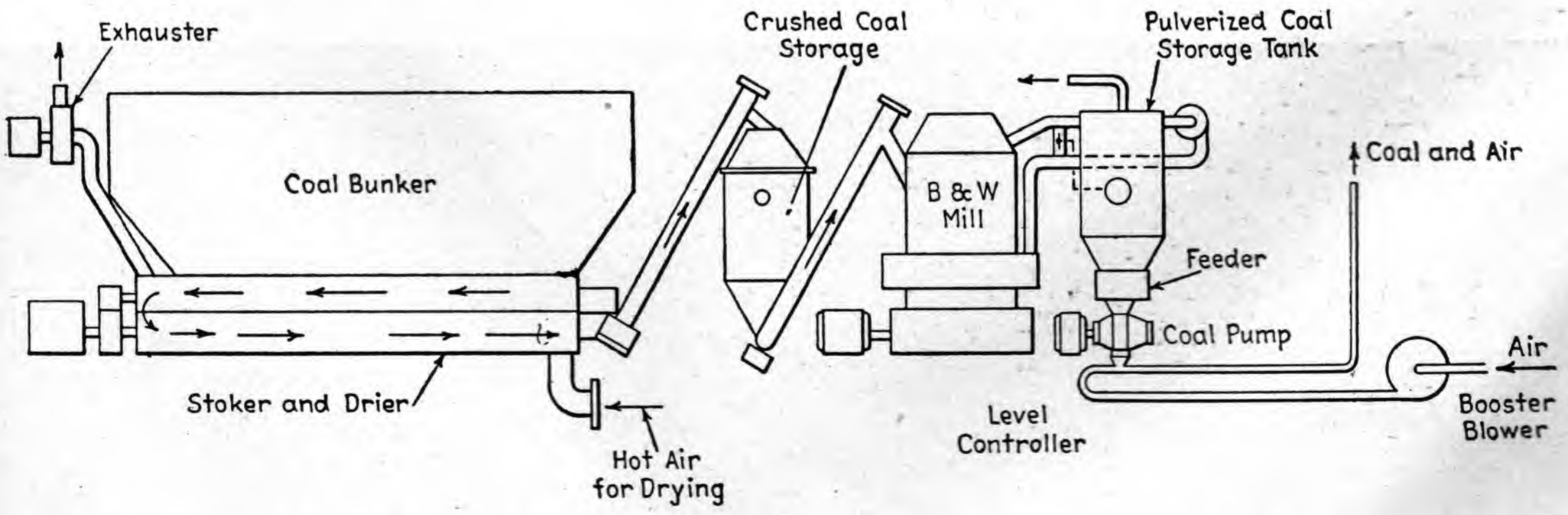
The performance of this locomotive has been generally satisfactory.[3,4] The cost of operation is said to compare favorably with a 4,500-hp. three-unit Diesel-electric locomotive, except, when operating on Diesel fuel oil, the fuel cost comparison was quite unfavorable. When operating on Bunker C oil, the comparison was better. Its operation in tunnels was satisfactory.

Pulverized-Coal-Burning Gas-Turbine Locomotive— After four years spent in research on the problems of coal handling, drying, pulverization, pressurization, feed control, combustion, and fly ash separation, a full-scale plant, utilizing a Houdry gas turbine unit, was placed in service by the Locomotive Development Committee of Bituminous Coal Research, Inc., at the Dunkirk, N. Y., plant of the American Locomotive Company in 1949.[3,5] The Allis-Chalmers turbine set for the first locomotive was delivered to the Dunkirk plant during October, 1950, where it will be used on the locomotive, and subjected to load and cyling tests. After these tests, the equipment will be installed in the two-unit locomotive.

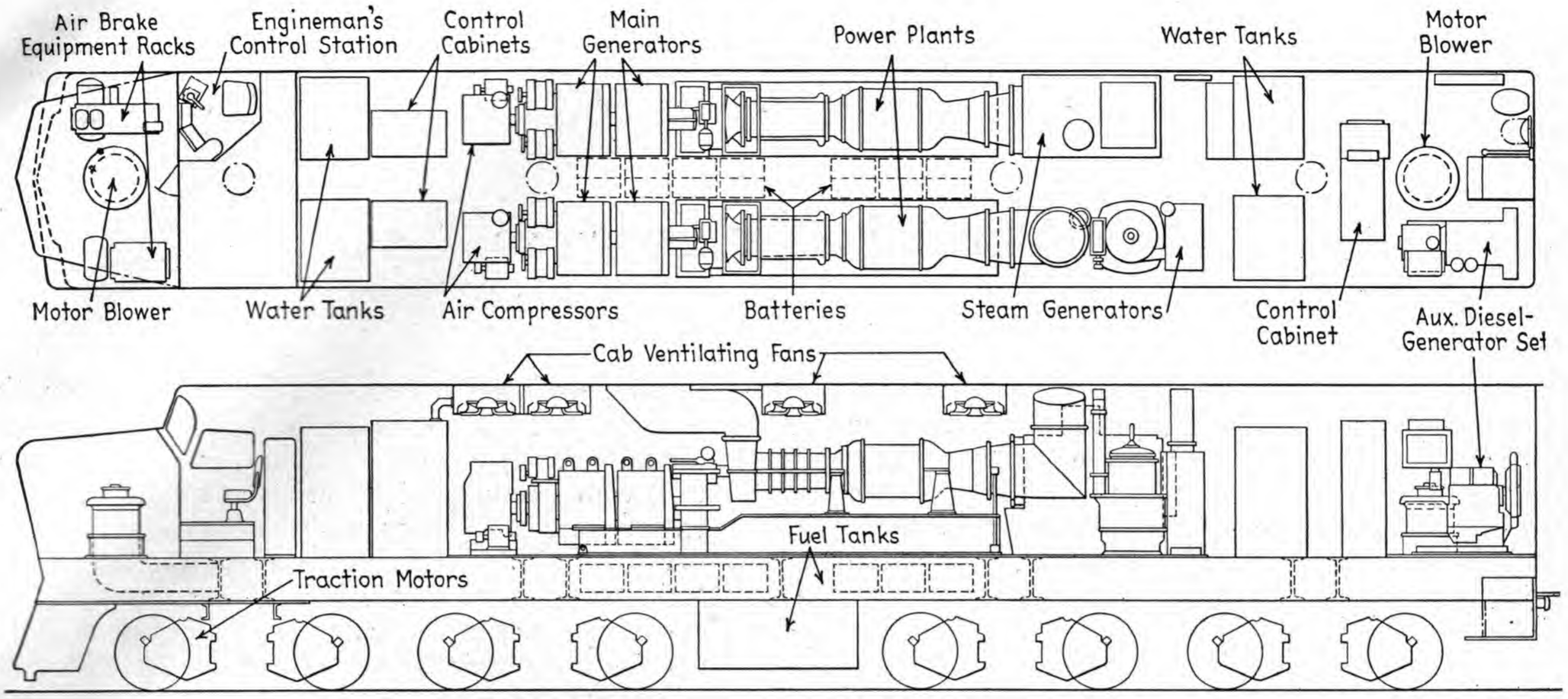
In one unit will be installed the coal bunker, stoker and dryer, the crushed-coal storage tank, the ball-mill pulverizer, the pulverized-coal storage tank, the pulverized-coal feeder which controls the output of the power plant, and the coal pump by which the pulverized coal is pressurized and from which the coal and air stream flow to the cumbustor. The other unit will contain the gas turbine and compressor, the electric generator and auxiliaries, and the combustor and ash-separation equipment. The turbine is designed to deliver 4,200 hp. at the generator. The locomotive is expected to be available for road tests during 1951.

The Westinghouse Oil-Fired Gas-Turbine-Electric Locomotive[6] is a single unit containing two 2,000-hp. turbines which is carried on four four-wheel trucks. It is an experimental unit. For passenger-train heating one turbine exhausts through a Babcock & Wilcox waste-heat boiler rated at 2,500 lb. of steam per hour. The other exhausts to the atmosphere. A standard steam generator supplies an additional 2,500 lb. per hour.

The Atchison, Topeka & Santa Fe Oil-Fired Gas-Turbine Locomotive[3] will be built by the Baldwin Locomotive Works. The Elliott Company turbine is rated at 3,750 hp. The locomotive is designed as a single cab unit with a



The coal-supply system which will be installed on the Locomotive Development Committee's gas-turbine locomotive



1—Power plants
2—Main generators
3—Traction motors
4—Control cabinets
5—Motor blowers
6—Auxiliary Diesel-generator set
7—Batteries
8—Engineman's control station
9—Air compressors
10—Air-brake equipment racks
11—Steam generators
12—Water tanks
13—Fue tanks
14—Cab ventilating fans

Wheel arrangement	B-B-B-B	Total locomotive weight, lb.	460,000
Length overall, ft.-in.	77 — 10	Weight on drivers, lb.	460,000
Width, ft-.in-.	10 — 0—¾	Per driving axle, lb.	57,500
Height, ft.-in.	14 — 1	Rated hp.	4,000
Rigid wheel base, ft.-in.	9 — 0	Starting Tractive force—25 per cent adhesion	115,000
Total wheel base, ft.-in.	62 — 9	Continuous tractive force	52,800
Wheel diameter, ft.-in.	0 — 42	Maximum speed m.p.h.	100

General arrangement and dimensions of the Westinghouse experimental gas-turbine-electric locomotive

4-8-8-4 wheel arrangement. The turbine has been under tests at the plant of the builder. Completion of the locomotive is expected before the end of 1952.

Lima-Hamilton Free-Piston Gas-Turbine Locomotive—An oil-burning free-piston gasifier has been developed by the Lima-Hamilton Corporation, a battery of six of which will provide the gas to the turbine of the 3,200-hp. locomotive which this company proposes to build.[3] The gas turbine and electrical equipment are from Westinghouse Electric Company.

Bibliography

[1] Reports of the Turbine and Condensing Locomotive Committee, Railway Fuel and Traveling Engineers' Association for 1939-44, inclusive. See Railway Mechanical Engineer, April, 1940, page 144; November, 1940, page 503; October, 1941, page 420; November, 1942, page 491; December, 1943, page 581; November 1944, page 524.

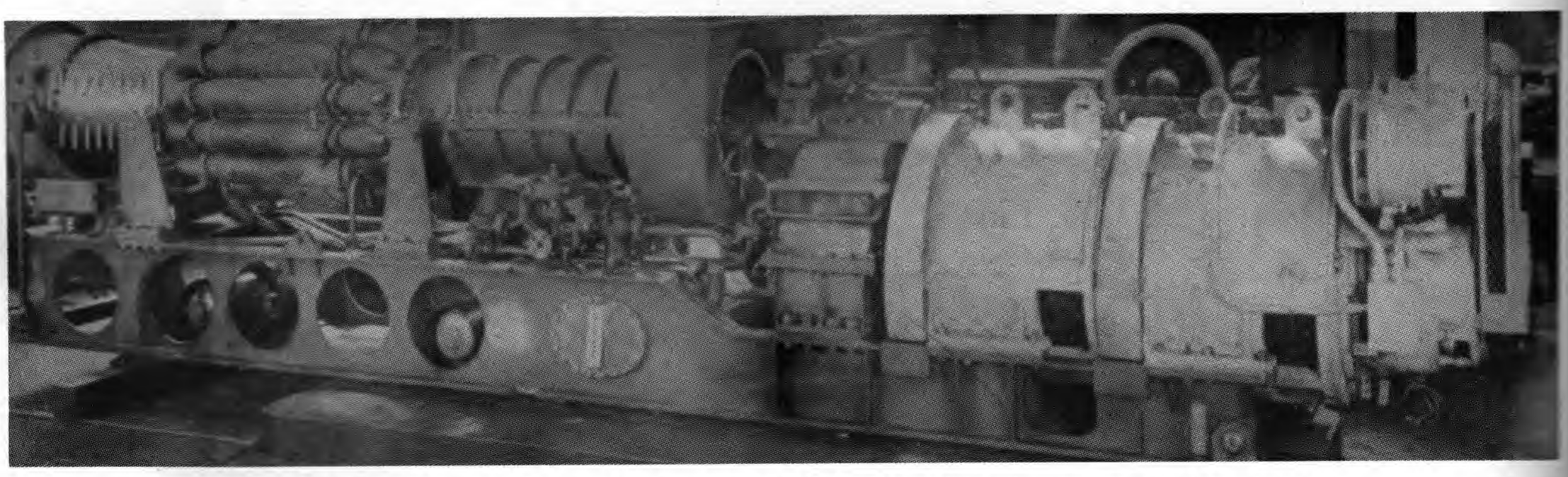
[2] Alco-GE Gas-Turbine-Electric Locomotive, by P. T. Egbert and G. W. Wilson, Railway Age, July 2, 1949, page 5; Railway Mechanical Engineer, July, 1949, page 363.

[3] Report of Committee on Locomotive Construction, Mechanical Division, Association of American Railroads, Circular No. D.V.-1217, Exhibit GT-1, page 31. For abstracts, see Railway Age, July 8, 1950, page 84; Railway Mechanical and Electrical Engineer, August, 1950, page 429.

[4] Gas-Turbine-Electric Locomotives, by R. A. Williamson (abstract of a paper before the Railway Fuel and Traveling Engineers' Association, 1950), Railway Mechanical and Electrical Engineer, November, 1950, page 673.

[5] The Gas Turbine at Dunkirk, by John I. Yellott (abstracts of a paper presented before the 1950 Midwest Power Conference), Railway Age, April 15, 1950, page 745; Railway Mechanical and Electrical Engineer, May, 1950, page 245.

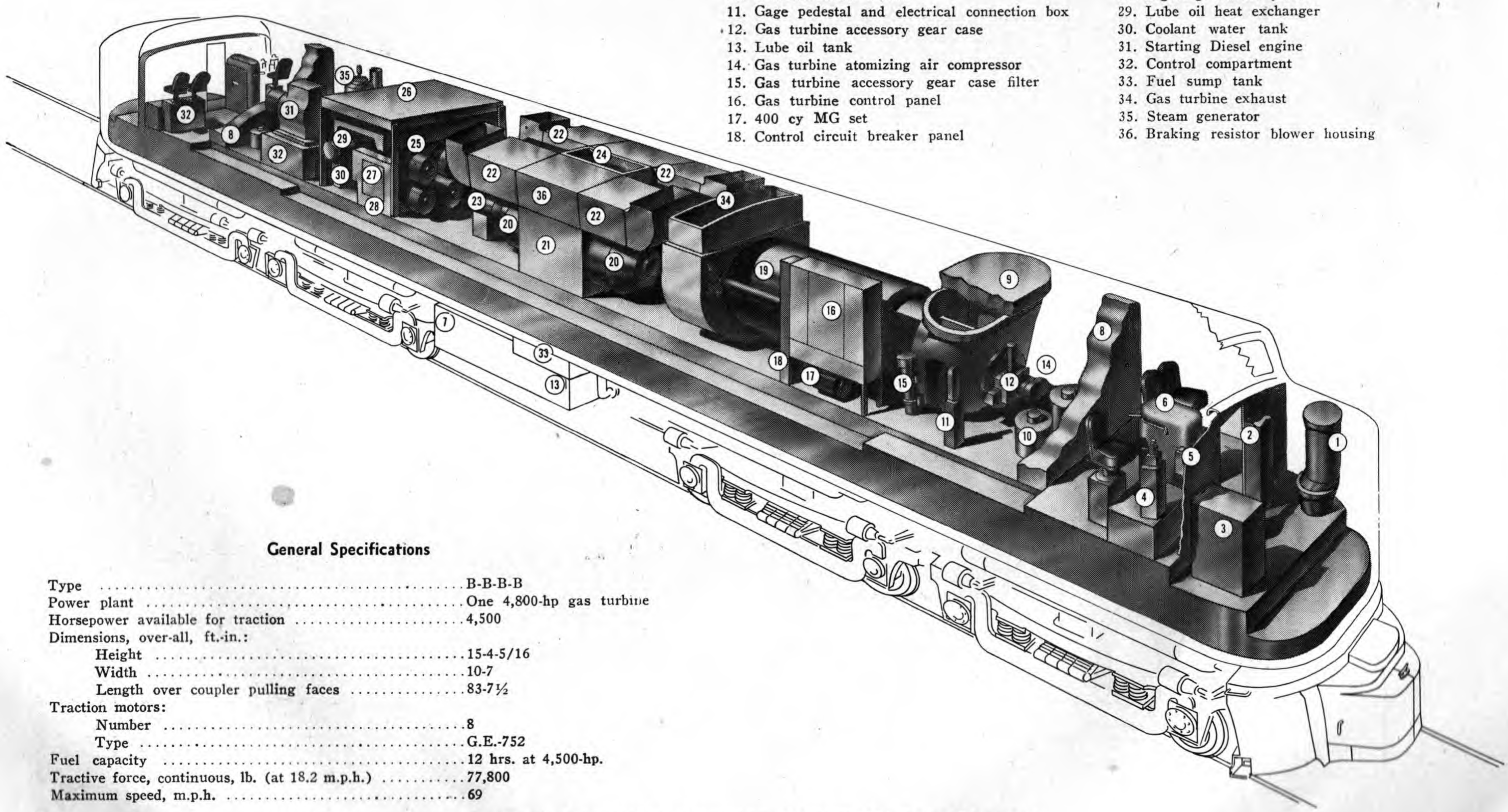
[6] 4,000-hp. Gas-Turbine Passenger Locomotives, by W. A. Brecht, Charles Kerr, Jr., and T. J. Putz (abstract of a paper presented before American Society of Mechanical Engineers, November 29, 1949), Railway Mechanical and Electrical Engineer, January, 1950, page 1.



One of the 2,000-hp. gas-turbine-electric power plants for the Westinghouse experimental locomotive

Location of Parts—Alco-G.E. Gas Turbine Electric Locomotive in Service on Union Pacific

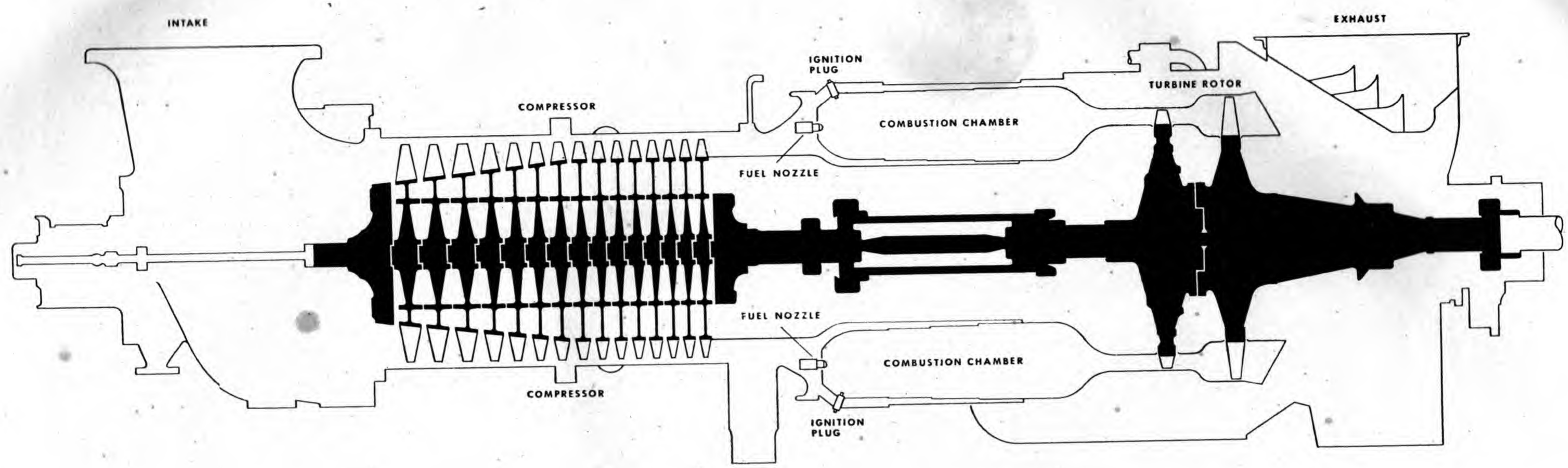
1. Filling connection for overhead fueling
2. Locker
3. Air brake equipment
4. Brake valve—automatic air brake
5. Independent brake valve
6. Controller
7. Battery compartment
8. Control compartment
9. Gas turbine inlet silencer
10. Traction motor blower
11. Gage pedestal and electrical connection box
12. Gas turbine accessory gear case
13. Lube oil tank
14. Gas turbine atomizing air compressor
15. Gas turbine accessory gear case filter
16. Gas turbine control panel
17. 400 cy MG set
18. Control circuit breaker panel
19. Gas turbine
20. Main traction generator
21. Main reduction gear
22. Braking resistor
23. Auxiliary generator, 75v, d-c
24. Generator exhaust
25. Amplidyne exciter
26. Radiator assembly
27. A-C breaker panel
28. Lighting breaker panel
29. Lube oil heat exchanger
30. Coolant water tank
31. Starting Diesel engine
32. Control compartment
33. Fuel sump tank
34. Gas turbine exhaust
35. Steam generator
36. Braking resistor blower housing



General Specifications

Type	B-B-B-B
Power plant	One 4,800-hp gas turbine
Horsepower available for traction	4,500
Dimensions, over-all, ft.-in.:	
Height	15-4-5/16
Width	10-7
Length over coupler pulling faces	83-7½
Traction motors:	
Number	8
Type	G.E.-752
Fuel capacity	12 hrs. at 4,500-hp.
Tractive force, continuous, lb. (at 18.2 m.p.h.)	77,800
Maximum speed, m.p.h.	69

American Locomotive Company—General Electric Company



Above—The power plant for the Alco-G.E. gas-turbine electric locomotive.

Right—The gas-turbine locomotive in freight service.

Railroad Cars

AMERICAN railroad cars had their beginning in crude four wheel vehicles resembling horse-drawn highway wagons and capable of carrying a load of about five tons. They were universally constructed with wooden bodies and those used in freight service generally were of the platform, open-top and house type. Cars for carrying commodities that required special handling, such as tank and refrigerator equipment, did not come into general use until after the Civil War. Four-wheel freight cars continued to be employed for many years, until the 1890's, primarily in the coal trade. However, long before that time, the double truck car became the principal carrier on the railroads and has remained so to the present day. Metal constuction of freight car bodies was tried early but no definite effort was made to build them in sizable quantities until 1895. Today practically all freight cars are constructed of steel with wooden lining and flooring in the closed types. Today's cars have a capacity ten times as great per unit as did their early predecessors.

Likewise passenger cars have developed from a small stagecoach-like body having a seating capacity of a dozen passengers to the 85-foot alloy steel or aluminum structure of today. Modern cars are made in an infinite number of combinations from mail, baggage, and full coaches to the variety of sleeping cars having several different accommodations. As with freight cars, wooden construction predominated in the passenger car field until 1906 at which time large numbers of steel cars were built. This long desired event took place nearly half a century after the advent of the earliest known all-metal passenger cars in 1859.

To transport many different kinds of lading in vast quantities freight cars are built in a variety of body types and capacities to meet the requirements of the shippers. Some of the railroads follow the Association of American Railroads Standards closely but others deviate from them in both general dimensions and in a number of details. The A.A.R. committee pointed out that the building of standard freight cars reduces initial costs, expedites delivery schedules, simplifies repairs and lowers the inventories of car repair parts.

Acting on recommendations from the Car Construction Committee, the Mechanical Division of the A.A.R. has adopted "Standard" or "Recommended Practice" designs for several types of freight cars, a number of which are included in this edition.

In order to define the various types of freight and passenger cars the Mechanical Division has adopted a series of Designation Classification Letters and Definitions that are revised from time to time to meet changing conditions. The general groups used by the A.A.R. are as follows:

Freight Train Cars

Class "X" Box Cars (plain, automobile, etc.)
Class "V" Ventilator Box Cars
Class "S" Stock Cars
Class "'R" Refrigerator Cars
Class "F" Flat Cars
Class "G" Gondola Cars
Class "H" Hopper Cars
Class "T" Tank Cars
Class "L" Special Cars
Class "N" Caboose Cars
Class "MW" Maintenance of Way Cars
Class "Y" Yard Cars

Passenger Train Cars

Class "B" Baggage Cars
Class "C" Combined Cars
Class "D" Dining Cars
Class "E" Electric or Motor Cars
Class "I" Instruction Cars
Class "M" Mail Cars
Class "P" Passenger Cars

Box Cars

Box cars are primarily employed to transport valuable commodities requiring protection from the weather or against breakage. Besides the plain type of box car intended for ordinary freight traffic there are box cars made to accommodate the products peculiar to certain industries such as automobiles, furniture, lumber, fruits and vegetables.

Express box cars equipped for passenger train operation are constructed essentially the same as those in freight service but are fitted with air, signal and steam-heat pipes and have passenger car type air brakes and high-speed trucks. There were 740,851 box cars in the United States at the end of 1948.

Refrigerator Cars

The transportation of perishable commodities such as meat, milk, fruit and vegetables forms an important part of railway traffic that must be protected at an even temperature regardless of weather conditions. Various types of refrigerator and heater cars are employed in this service and most of them are operated in freight trains with equipment designed for that purpose. The exception is milk in bulk which is usually transported in large insulated tanks mounted upon cars that are especially

equipped to run in passenger trains. A total of 131,412 refrigerator cars of all types are in service of which 111,179 are privately owned.

Stock Cars

Stock cars form a small percentage of the freight equipment on American railroads, accounting for only 3 per cent of the total inventory. The railroads of the United States own 49,918 stock cars according to the latest statistics. There are also 1,747 privately owned cars, making a total of 51,665 cars in this service.

Two types of stock cars predominate in the live animal carrying equipment. The single deck type for bovine cattle, mules, and horses and the double deck type for hogs, sheep and calves. There are also a few cars used for carrying live poultry with provisions and an attendant.

Flat Cars

Flat cars comprise an important group of freight carrying equipment, although they amount to a small percentage of the total number of cars in service. According to the I.C.C. statistics of Dec. 31, 1948, 67,479 flat cars were in service on the railroads of the United States.

Flat cars vary in capacity from 50 tons to 200 tons and are used in carrying the largest and heaviest materials. There are several special types employed, including well-hole, depressed-center and pulpwood cars.

No standard designs of flat cars have been made by the A.A.R.

Gondola Cars

No type of car has a greater usefulness in transporting a diversity of heavy and bulky commodities than the gondola. In the United States there are 319,781 gondola cars of all types, according to the latest statistics.

Gondola cars are primarily used for carrying minerals of all kinds, lumber, steel products and machinery. These shipments require cars constructed in a great variety of types including those with fixed ends and solid floors. Others are equipped with drop doors in the floor; some with drop ends for steel products and a few with swinging side doors.

Hopper Cars

Over 588,000 hopper cars provide the largest single number of open type cars and rank next to box cars in total numbers.

Their service is generally confined to transporting coal from the mines to destination and provides revenue in one direction only. In some instances return loads of iron ore and limestone are made.

There are numerous hopper cars of various designs made for carrying other commodities and in special service including stone, ore, coke, cement, phosphate and other chemical compounds. The Association of American Railroads has adopted two designs of hopper cars as standard. A 50-ton car with two hoppers and a 70-ton car with three hoppers.

Covered Hopper Cars

A self-clearing permanently enclosed car, with or without insulation, having fixed roof, sides and ends, and provided with openings for loading through roof or sides. The loading openings are fitted with weather-tight covers or doors. Covered hopper cars also are provided with bottom openings for unloading, with tight-fitting covers, doors or valves. About 21,000 of these cars are in service.

Tank Cars

The transportation of bulk freight in liquid or semi-liquid form requires the use of a large number of tank cars of various types. About four hundred different commodities are thus handled. The products include crude oil, fuel oils, lubricating oils, gasoline, kerosene, alcohols, acids, alkalis, coal tar products, chlorine, bleaches, insecticides and fungicides, animal, vegetable and fish oils, fruit juices, beer, milk, paints, varnishes and lacquers and compressed gasses.

Many of these commodities require special linings or material in the tanks to prevent their destruction and contamination of their products. Some tanks are made of aluminum, wood, or nickel steel to preserve them from the corrosive action of the contents. Others are lined with rubber, glass, enamel or stainless steel. For the transportation of compressed gases under high pressures, multiple cylinders or containers of comparatively small diameter are mounted on or form part of the car.

Due to the dangerous character of many of the products carried in tank cars, their design and operation is prescribed by the Interstate Commerce Commission as well as the Association of American Railroads. The fabrication of tanks by either fusion or forge welding is now common practice.

Approximately 150,625 tank cars are operated in the United States. Of these, 8,806 are owned by railroads and 141,819 by private car lines.

Caboose Cars

Caboose cars are universally used as the last car on freight trains in which the crew rides and the conductor makes out and keeps his records. Supplies of lanterns and other signal materials are carried along with emergency tools. On some roads cabooses are also used for drovers accompanying cattle or poultry shipments. For branch line service and local mixed trains combination caboose and passenger or express cars are sometimes employed. Modern cabooses are usually of all steel construction with two four-wheel trucks of special desig

for easy riding. For better observation of running gear on trains the side-bay type has been built for a number of roads while others still retain the roof cupola type. A recent development has been the communication systems installed in cabooses with which the conductor can converse with the engineman, yard office or dispatcher. A total of 24,660 caboose cars are owned by the railroads of the United States.

Work Cars

Maintenance of the railway roadbed, building of new lines, and general construction work in connection with railroad operations requires the use of many types of special service cars. These include dump cars, motor and hand cars, locomotive cranes, steam shovels, pile-drivers, ditchers, flangers, snow plows, sweepers, and various other special cars for transporting the materials used and the men engaged in maintenance service. Wrecking, instruction and dynamometer cars are also included in the service car group. This class of equipment has been officially recognized and classified by the Mechanical Division of the Association of American Railroads. Over 96,000 cars in work service are owned by United States railroads.

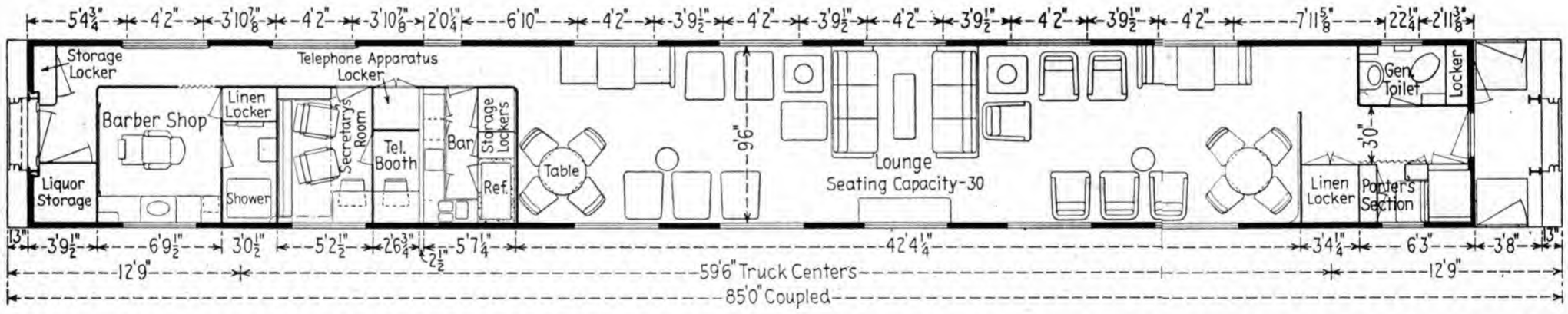
Passenger Cars

Passenger equipment includes coaches and parlor, observation, sleeping, dining, buffet, cafe, club, and business cars for carrying passengers; and baggage, express, and postal cars for handling baggage, merchandise and mail in passenger trains. Some passenger train cars are also equipped with refrigeration facilities for transporting milk and other perishable products. A total of 43,813 passenger train cars including 5,807 Pullmans are in use.

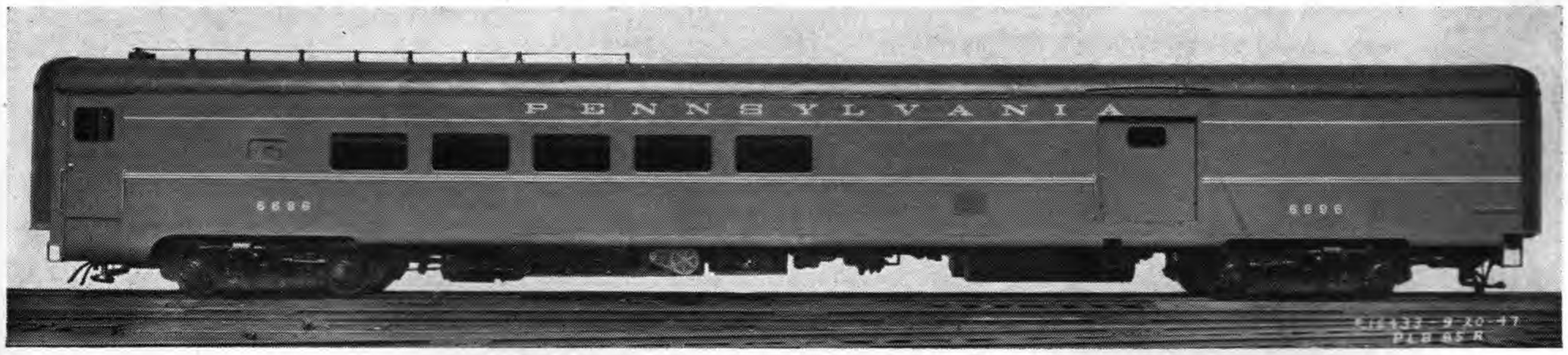
Motor Cars

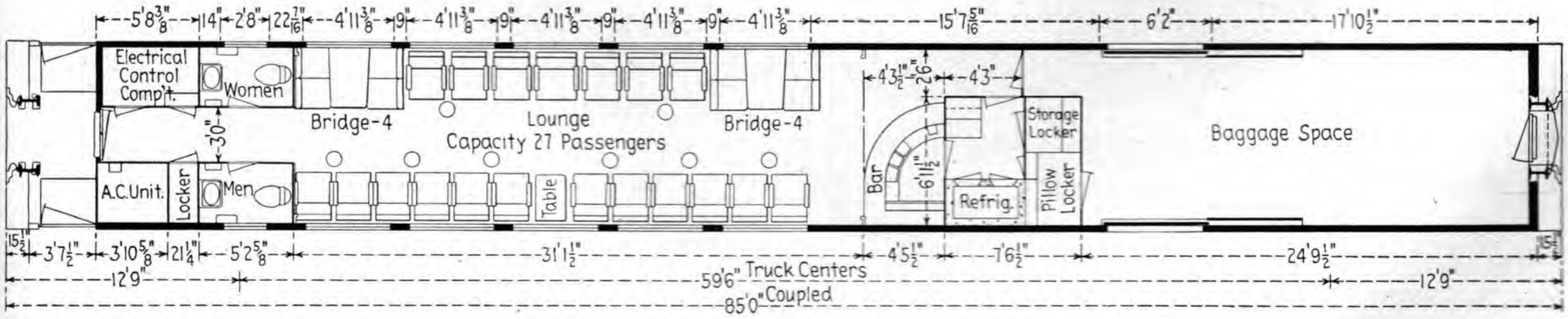
The use of motor cars is quite extensive in city rapid transit, suburban, and branch line service. In densely populated districts where smoke and other features of steam operation are objectionable, electric motor cars operated from power transmission lines are generally employed.

For lighter traffic on main lines and branch line service, motor cars equipped with internal combustion engines are frequently used. Most cars of this type are driven by the interposition of electric transmission between the engine and driven axles, while others use some form of mechanical or hydraulic drive. A few cars have been equipped with steam engines.

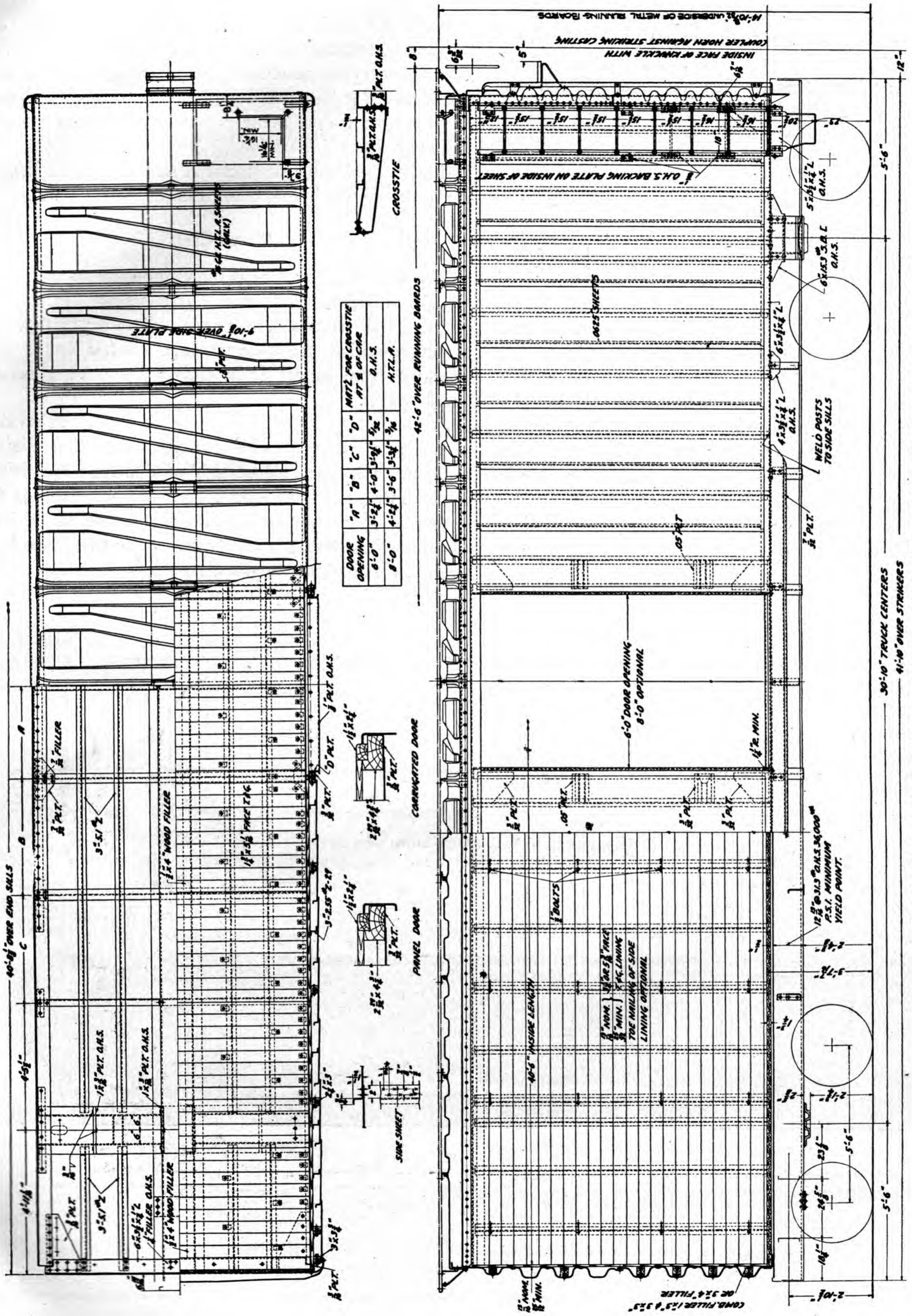


Floor plan of N. Y. C. lounge-barber shop car.



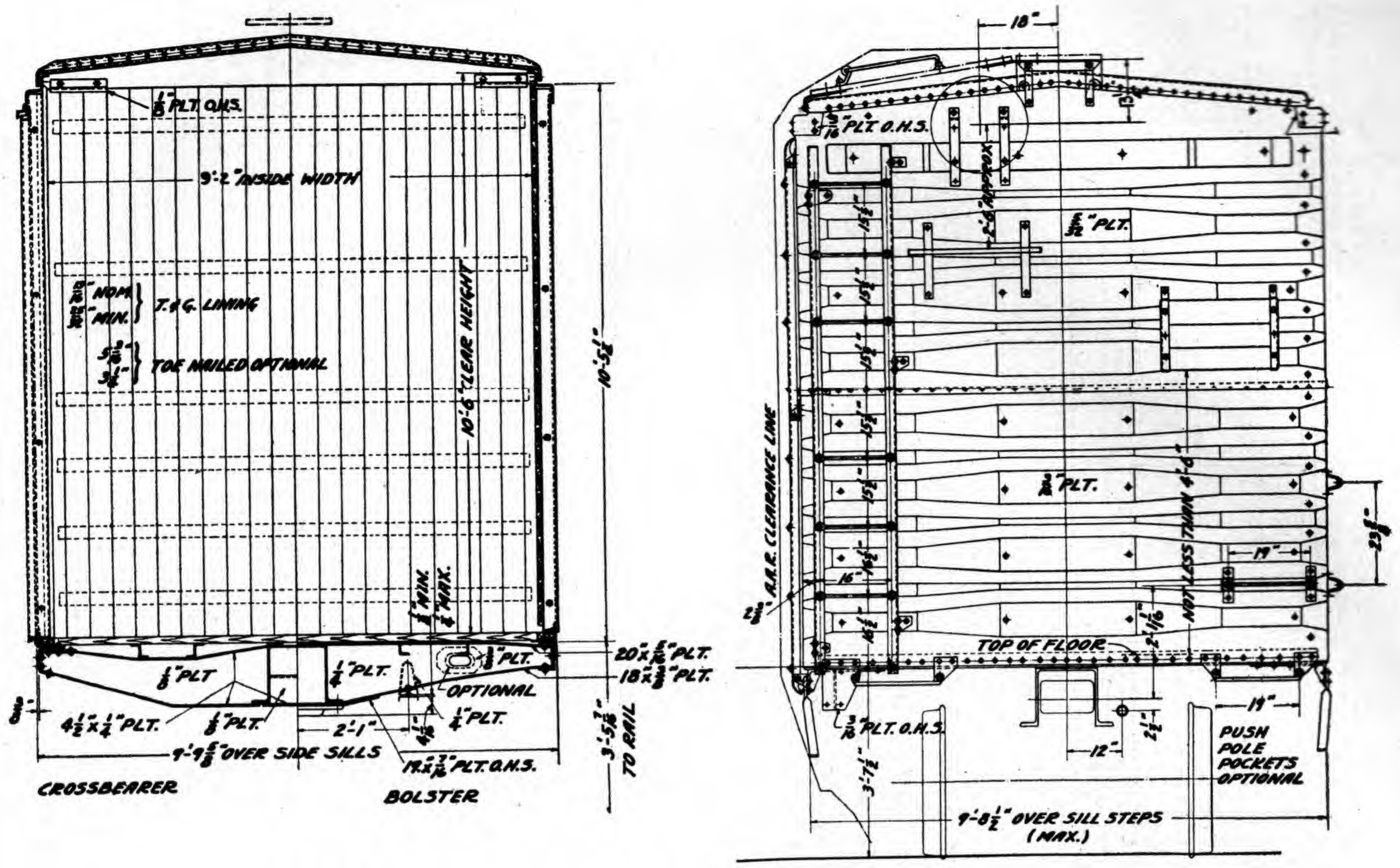


Floor plan and exterior view of Pennsylvania lounge-baggage car.



Plan and elevation of A. A. R. Standard 40 ft. 6 in., 50-ton, light-weight welded steel box car.

(See also opposite page and A.A.R. Supplement to Manual, Plate 1600A)

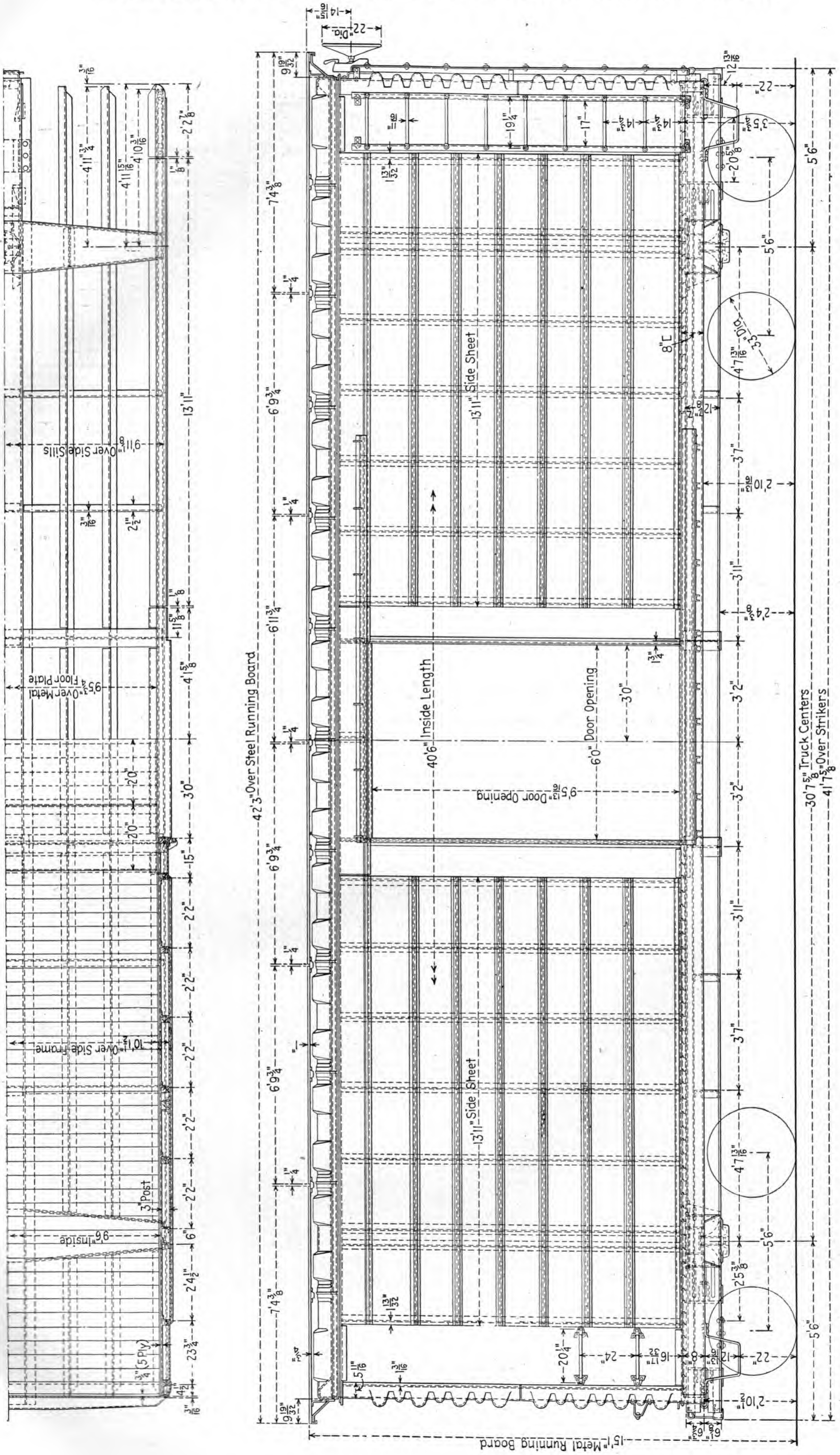


Section and end view of A. A. R. Standard 40 ft. 6 in., 50-ton, light-weight welded box car.

(See also opposite page and A. A. R. Supplement to Manual, Plate 1600A)

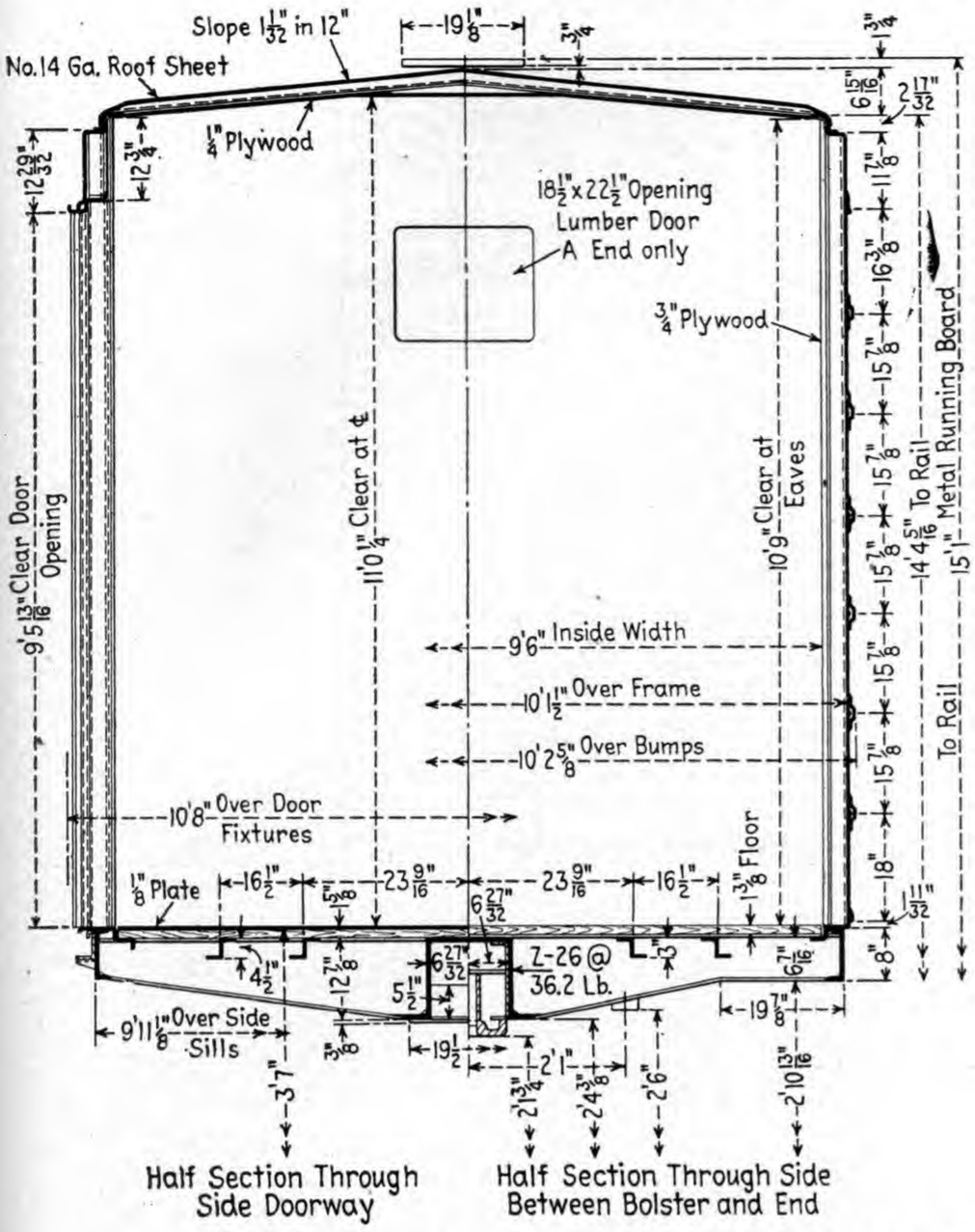
Chicago, Milwaukee, St. Paul & Pacific, 50-ton, 40 ft. 6 in., steel-sheathed box car. Built at Milwaukee shops.

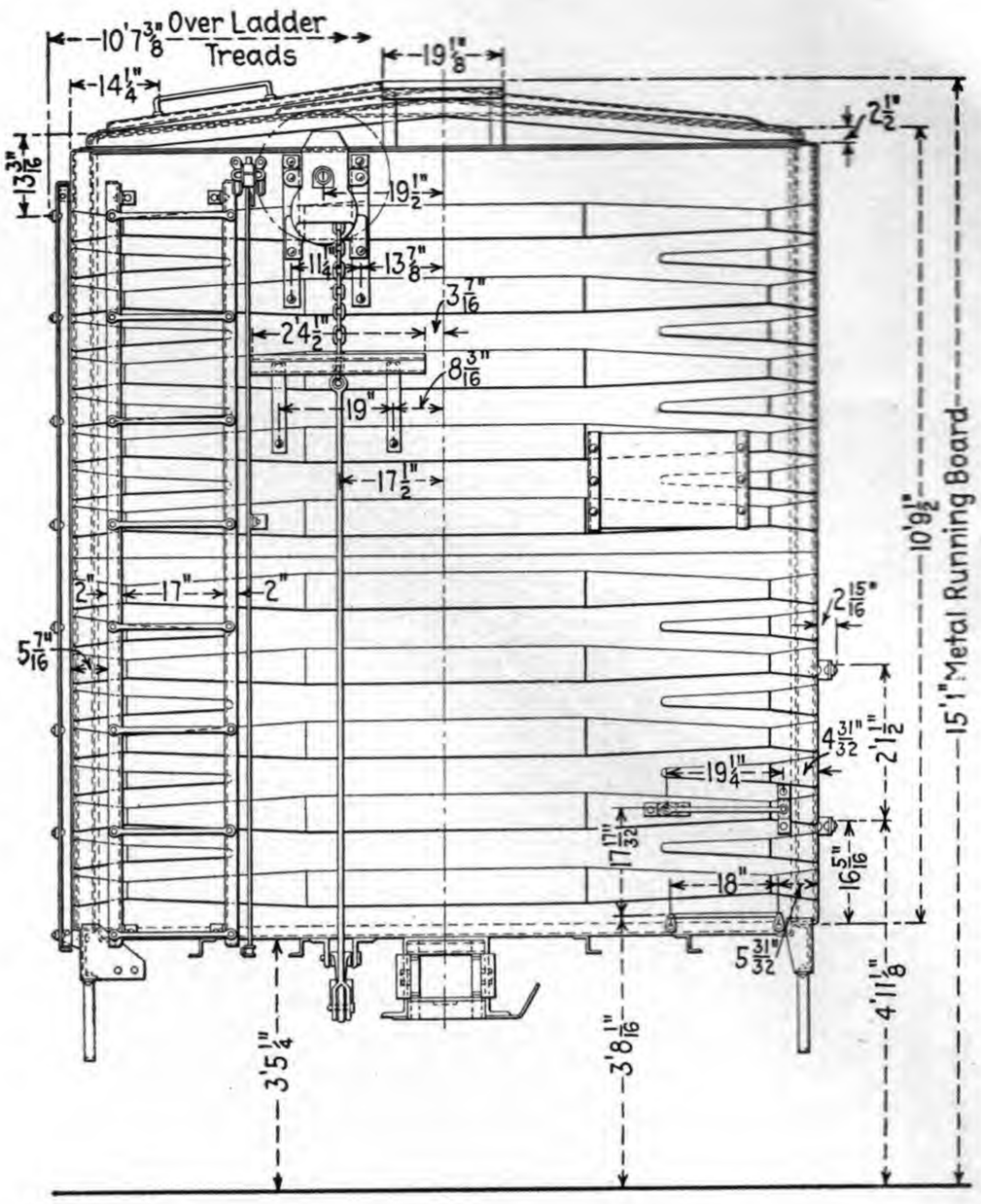
Inside, length 40 ft. 6 in.; width 9 ft. 6 in.; height 10 ft. 9 in.; doors, 6 ft. 0 in.; capacity, 4,136 cu. ft.; light weight, 43,300 lb.; **load limit** 125,700 lb.



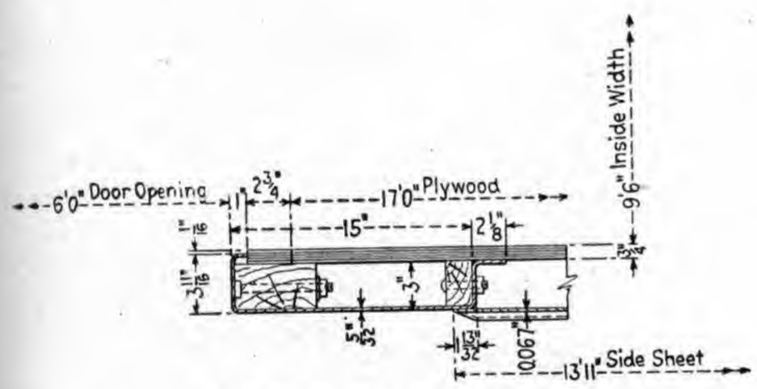
Plan and elevation of Chicago, Milwaukee, St. Paul & Pacific 50-ton, 40 ft. 6 in., welded steel box car, series 23,188-23,937. Built at railroad shops.

Inside, length 40 ft. 6 in., width 9 ft. 6 in., height 10 ft. 9 in., capacity 4136 cu. ft.

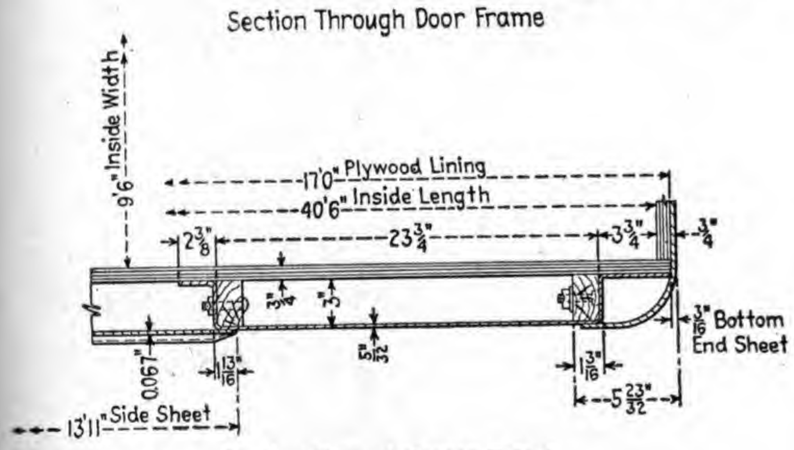

Slope 1 1/32" in 12"
No.14 Ga. Roof Sheet
1/4" Plywood
18 1/2" x 22 1/2" Opening
Lumber Door
A End only
3/4" Plywood
9'5 13/16" Clear Door Opening
11'0 1/4" Clear at ℄
10'9" Clear at Eaves
15'1" Metal Running Board
14'4 5/16" To Rail
9'6" Inside Width
10'1 1/2" Over Frame
10'2 5/8" Over Bumps
10'8" Over Door Fixtures
1/8" Plate
Z-26 @ 36.2 Lb.
9'11 1/8" Over Side Sills
Half Section Through Side Doorway
Half Section Through Side Between Bolster and End



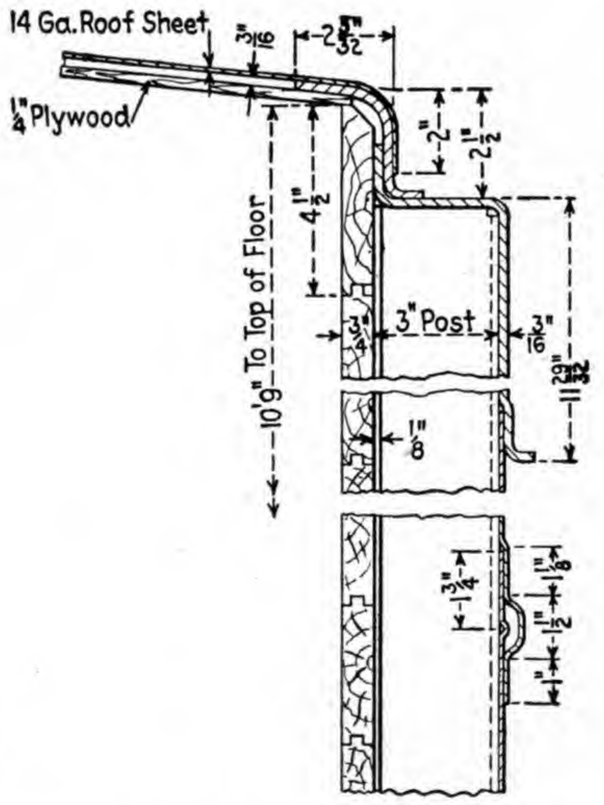
Cross-sections and end view of C. M. St. P. & P. 50-ton, 40 ft. 6 in. welded steel box car shown on opposite page.



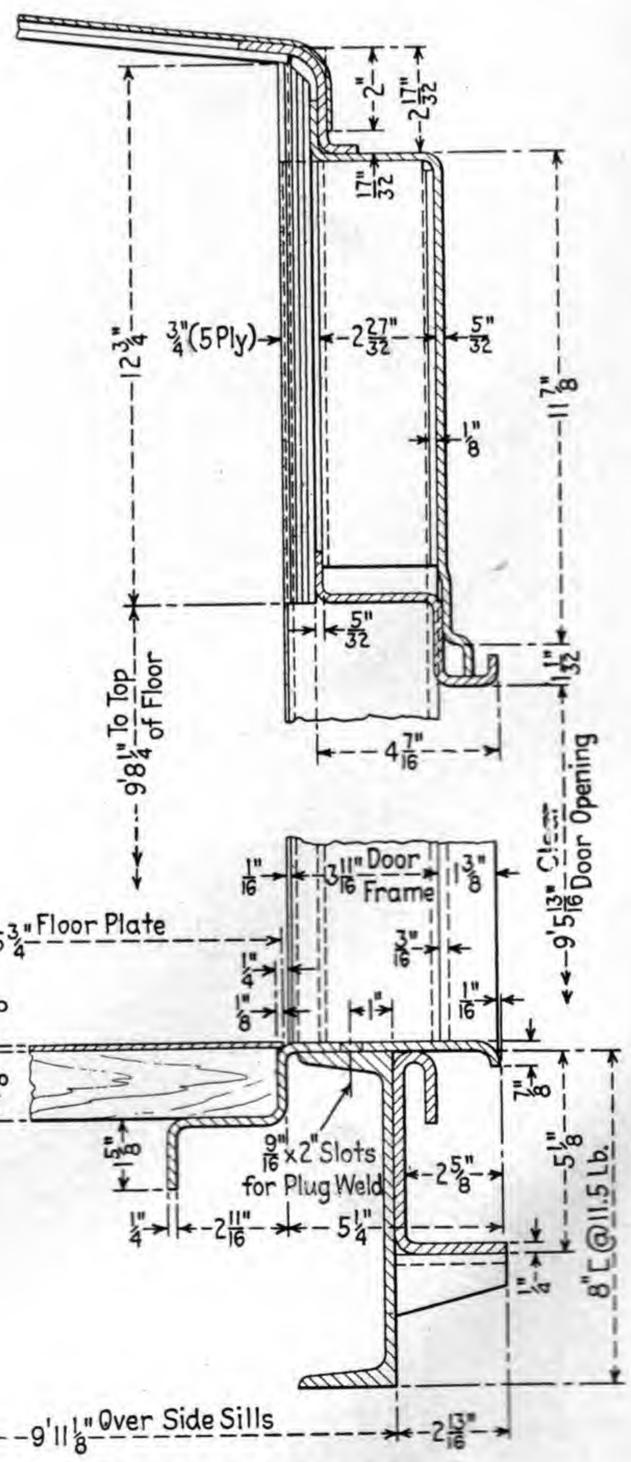
Section Through Door Frame



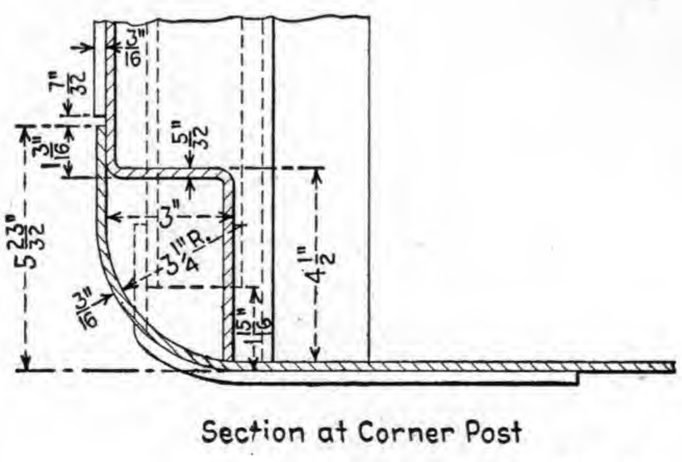
Section Through Corner Frame



Section at Side

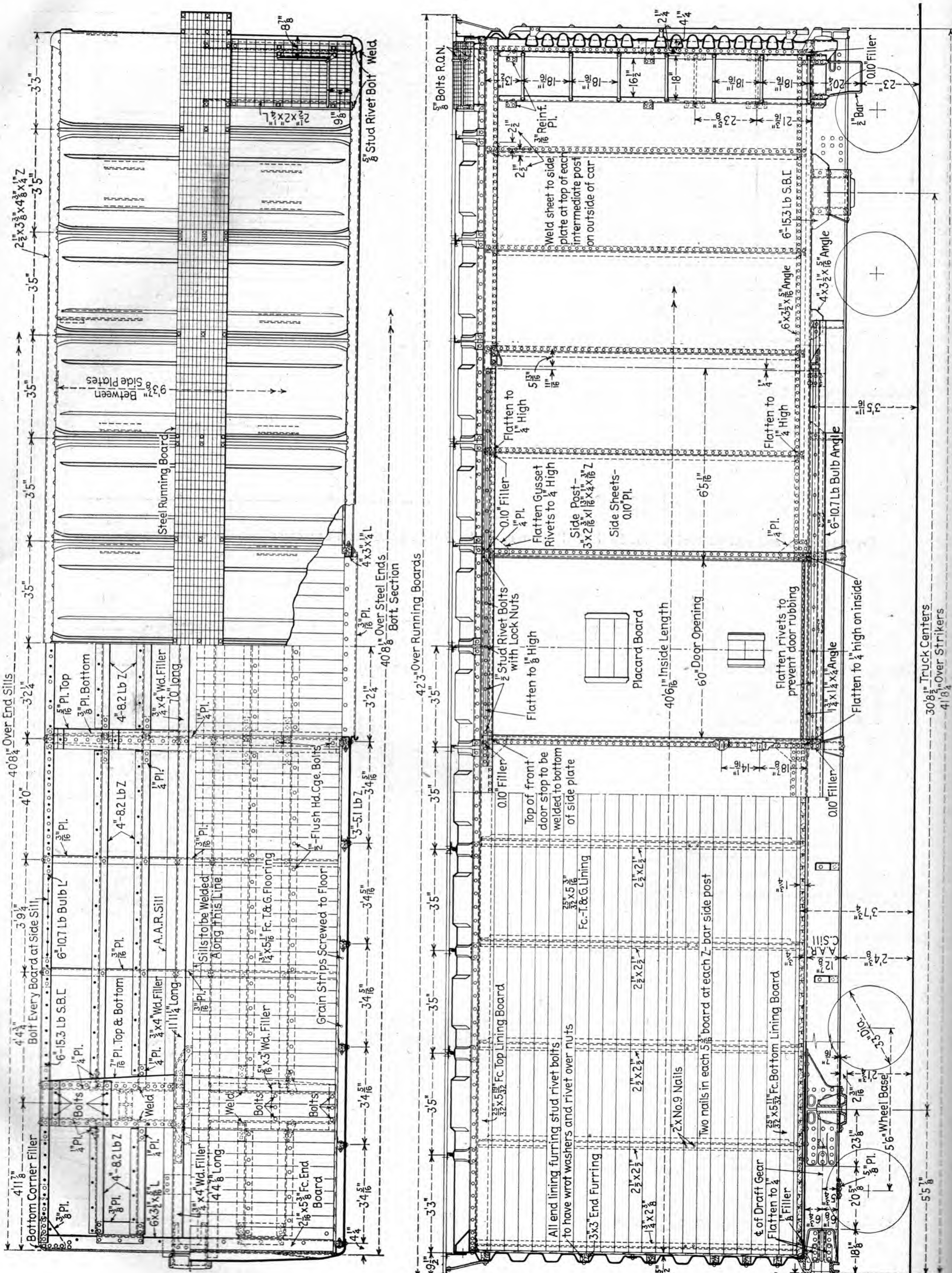


Vertical Section at Door Opening



Section at Corner Post

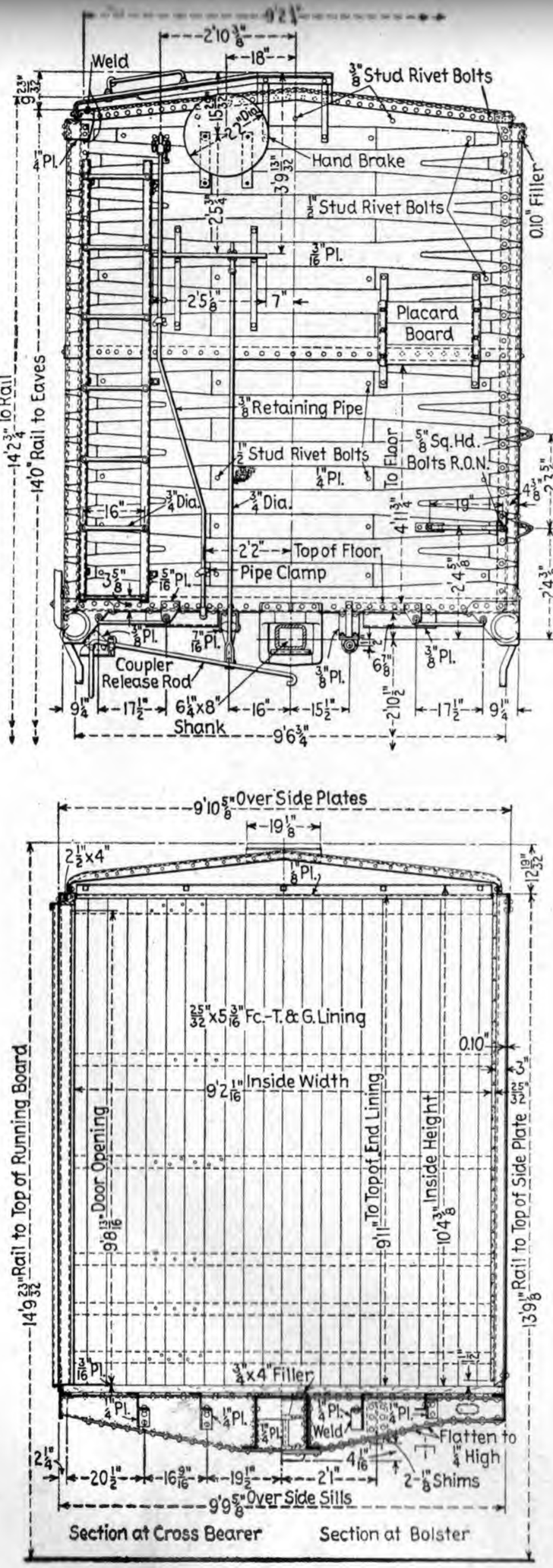
Sectional details showing construction of C. M. St. P. & P. welded box car shown above.


Steel Running Board
Grain Strips Screwed to Floor
Bolt Every Board at Side Sill
Bottom Corner Filler
Over End Sills
Over Steel Ends
Bott. Section Boards
Over Running Boards
Truck Centers
Over Strikers
Inside Length
Door Opening
Placard Board
Wheel Base
Inside dimensions
Flatten to 1" High
Flatten rivets to prevent door rubbing
Top of front door stop to be welded to bottom of side plate
All end lining furring stud rivet bolts to have wrot washers and rivet over nuts
Two nails in each 5 3/16" board at each Z-bar side post
Weld sheet to side plate at top of each intermediate post on outside of car
Side Post- 3"x2 3/16"x1 13/16"x1/4"x3/16" Z
Side Sheets- 0.10" Pl.
Flatten Gusset Rivets to 1/4" High
Fc.-T.&G. Lining
Fc.-T.&G. Flooring
Sills to be Welded Along This Line
Weld
Bolts
Flush Hd. Cge. Bolts
Steel Ends
Bott. Section
Boards
Over Running Boards
Truck Centers
Over Strikers
Inside dimensions
Flatten to 1" High
Flatten rivets to prevent door rubbing
Top of front door stop to be welded to bottom of side plate
All end lining furring stud rivet bolts to have wrot washers and rivet over nuts
Two nails in each 5 3/16" board at each Z-bar side post

Erie 50-ton, 40 ft. 6 in., steel-sheathed wood-lined box car. Series 82500-83199. Modified A. A. R. 1937 desigı.
Builder, American Car and Foundry Co.

Inside, length 40 ft. 6 in., width 9 ft. 2 in., height 10 ft. 4 in., doors 6 ft. 0 in. Light weight 45,200 lb. (body 30,200 lb., trucks 14,400 lb.); oad limit, 123,800 lb.; cubic capacity, 3,836 cu. ft.

(See also opposite page)

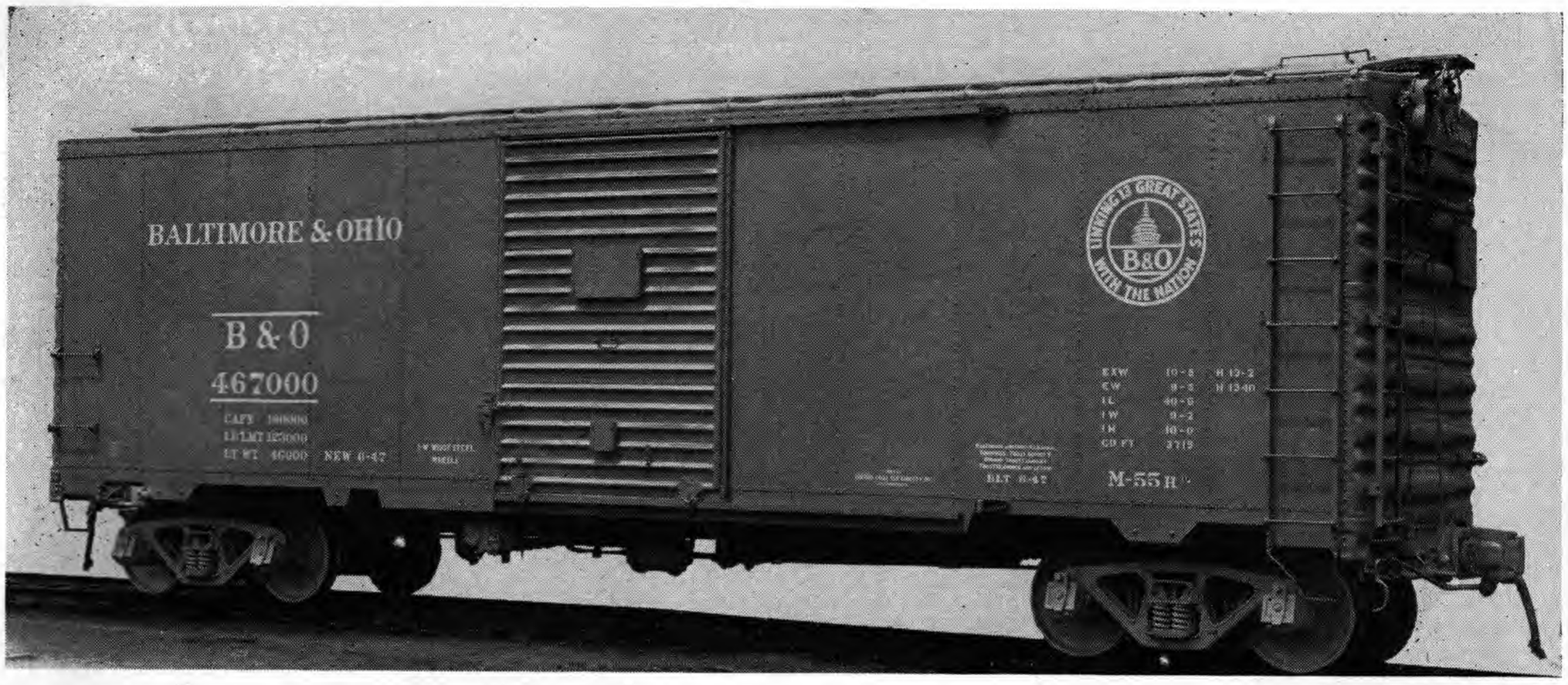


End elevation and sections of Erie steel-sheathed box car.

(See also opposite page)

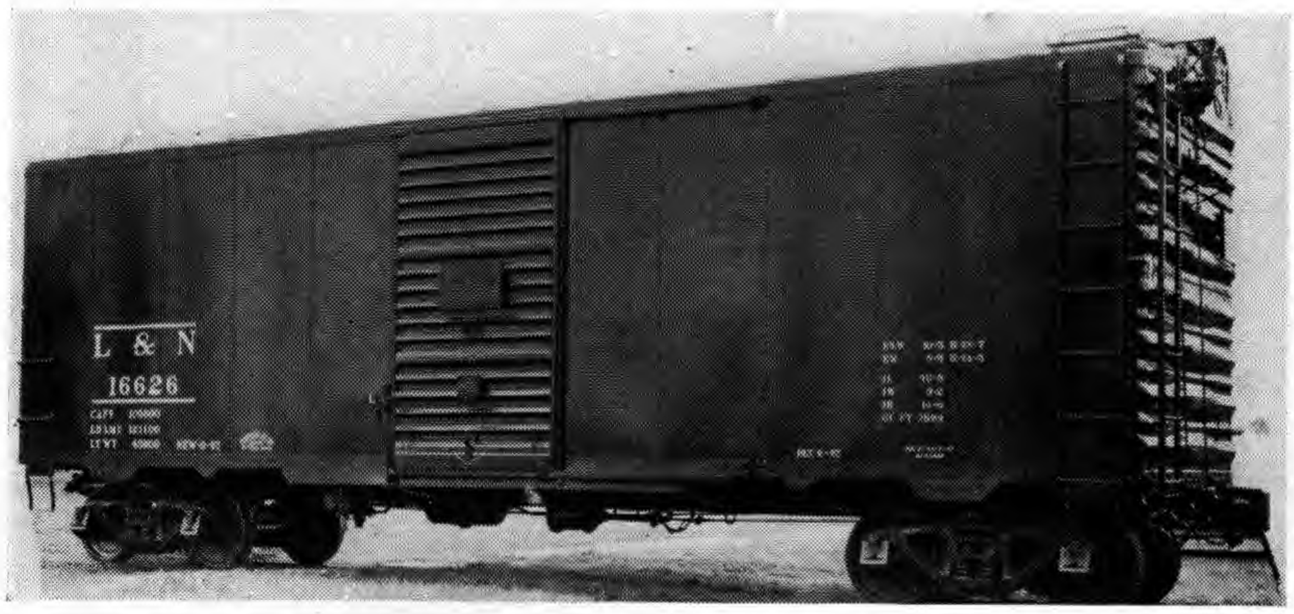
Southern Railway A.A.R. standard 40-ton, 40 ft. 6 in., steel-sheathed wood-lined box car. Series 10000-15815. Inside, 40 ft. 6 in., width 9 ft. 2 in., height 10 ft. 0 in., doors 6 ft. 0 in.

Light weight 44,700 lb.; load limit 91,300 lb.; cubic capacity 3,712 cu. ft.



Baltimore & Ohio 50-ton, 40 ft. 6 in., steel-sheathed box car. Equipped with Duryea Cushion Underframe. Road Class M-55-H. Builder, Pressed Steel Car Company, Inc.

Inside, length, 40 ft. 6 in.; width, 9 ft. 2 in.; height, 10 ft. 0 in.; capacity, 3,715 cu. ft.; light weight, 46,000 lb.; load limit, 123,000 lb.

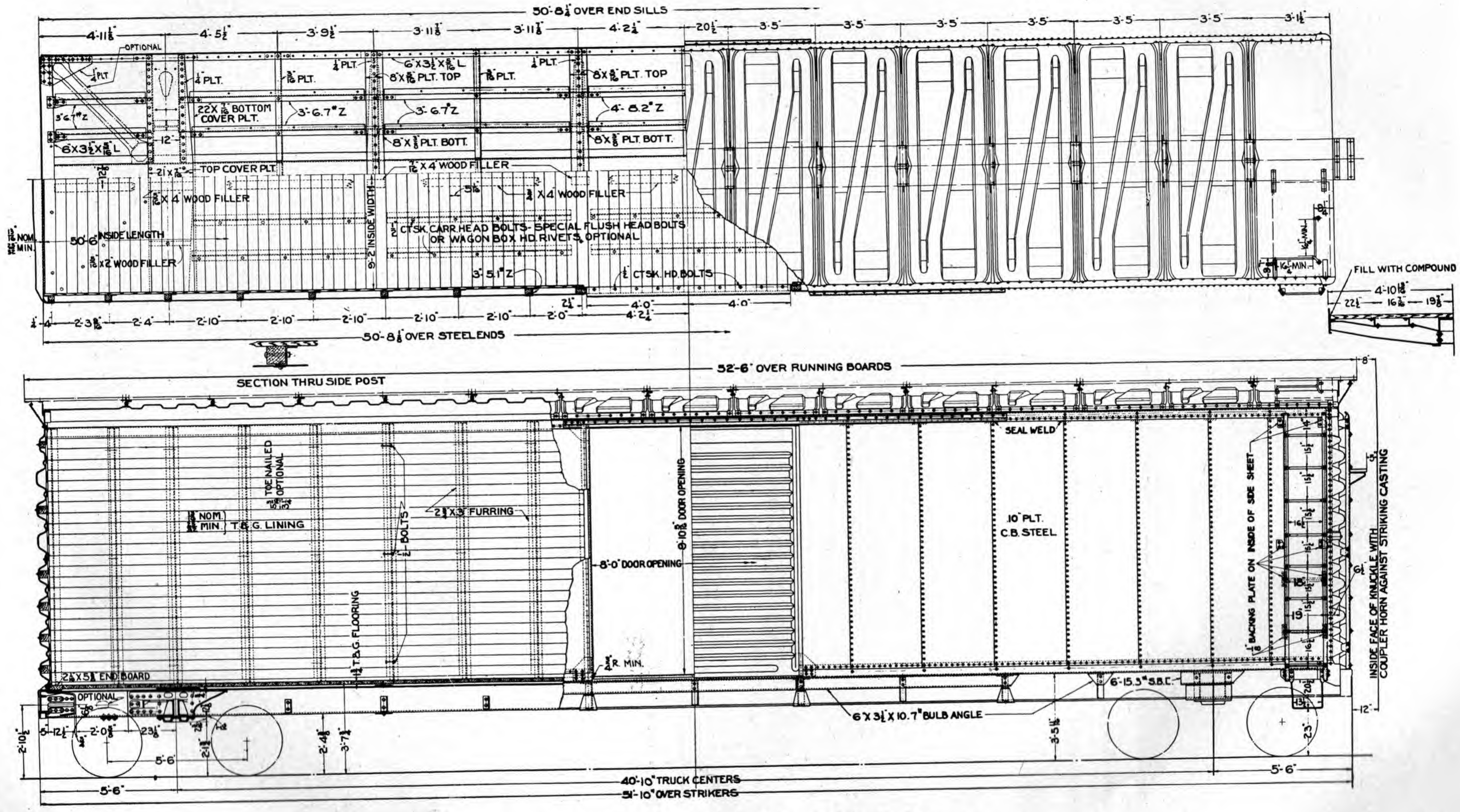


Louisville & Nashville 50-ton, 40 ft. 6 in., steel-sheathed box car. Builder, Mt. Vernon Car Manufacturing Division, Pressed Steel Car Company, Inc.

Inside, length, 40 ft. 6 in.; width, 9 ft. 2 in.; height, 10 ft. 6 in.; capacity, 3,899 cu. ft.; light weight, 45,900 lb.; load limit, 123,100 lb.

Denver & Rio Grande Western 50-ton, 40 ft. 6 in., steel-sheathed light weight box car. Equipped with Duryea Cushion Underframe. Builder, Pressed Steel Car Company, Inc.

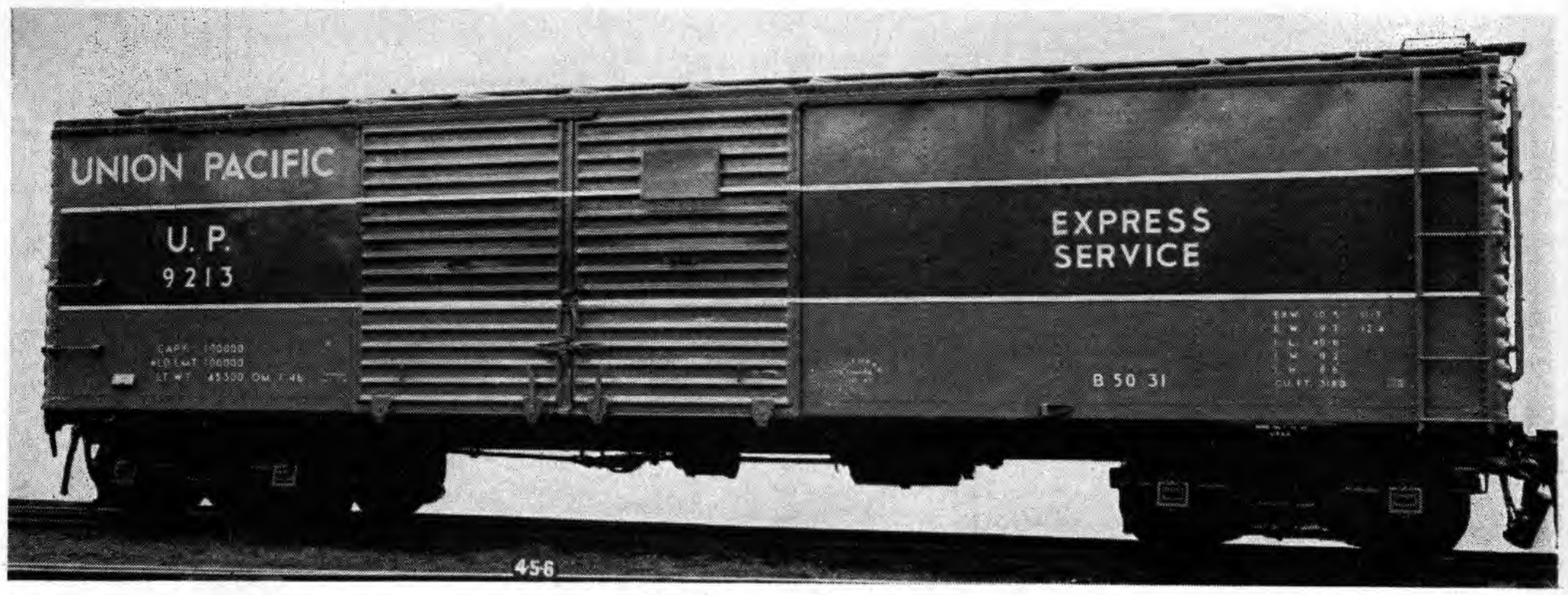
Inside, length, 40 ft. 6 in.; width, 9 ft. 2 in.; height, 10 ft. 4 in.; capacity, 3,850 cu. ft.; light weight, 43,500 lb.; load limit, 125,500 lb.



A. A. R. Standard 50-ton, 50 ft. 6 in., steel-sheathed box car.
Door openings, optional, 6 ft. 0 in., or 8 ft. 0 in.
Capacity, 4,950 cu. ft.; inside, length 50 ft. 6 in.; width 9 ft. 2 in.; height at eaves 10 ft. 6 in.
From A.A.R. Supplement to Manual, Plates 1525 *and* 1527—*For end elevation and cross section see page* 183

New York Central 25-ton box car for high-speed service, equipped with Waughmat Twin-Cushion draft gear, AB-1-B brakes and high-speed trucks. Builder, Despatch Shops, Inc.

Inside length, 40 ft. 6 in.; width, 9 ft. 2 in.; height, 10 ft. 0 in.; capacity, 3,712 cu. ft.; load limit, 50,000 lb.; limit weight, 45,300 lb.

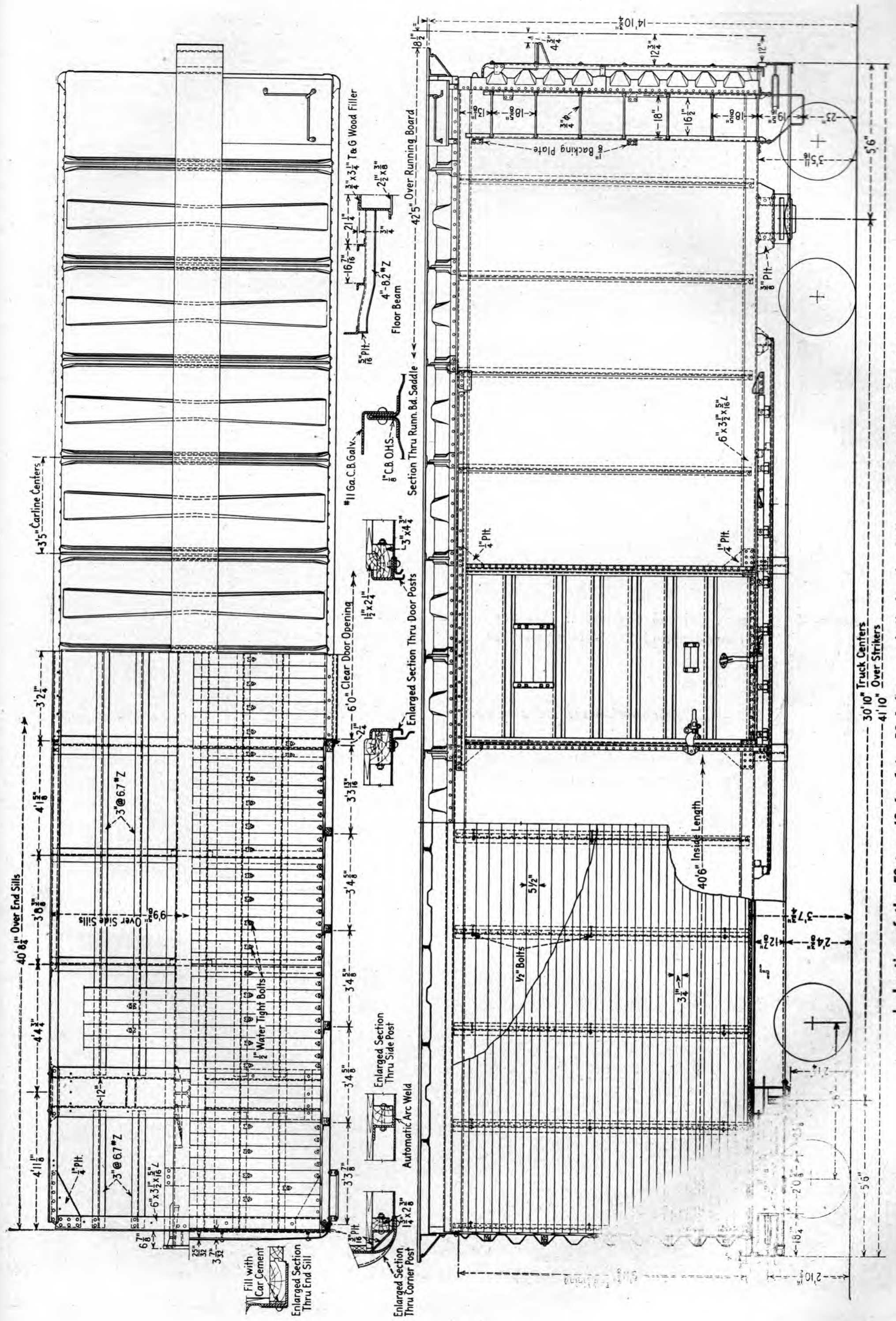


Union Pacific 50-ton box car for express service—equipped for passenger-train operation. Road Class B-50-31. Built at railroad shops.

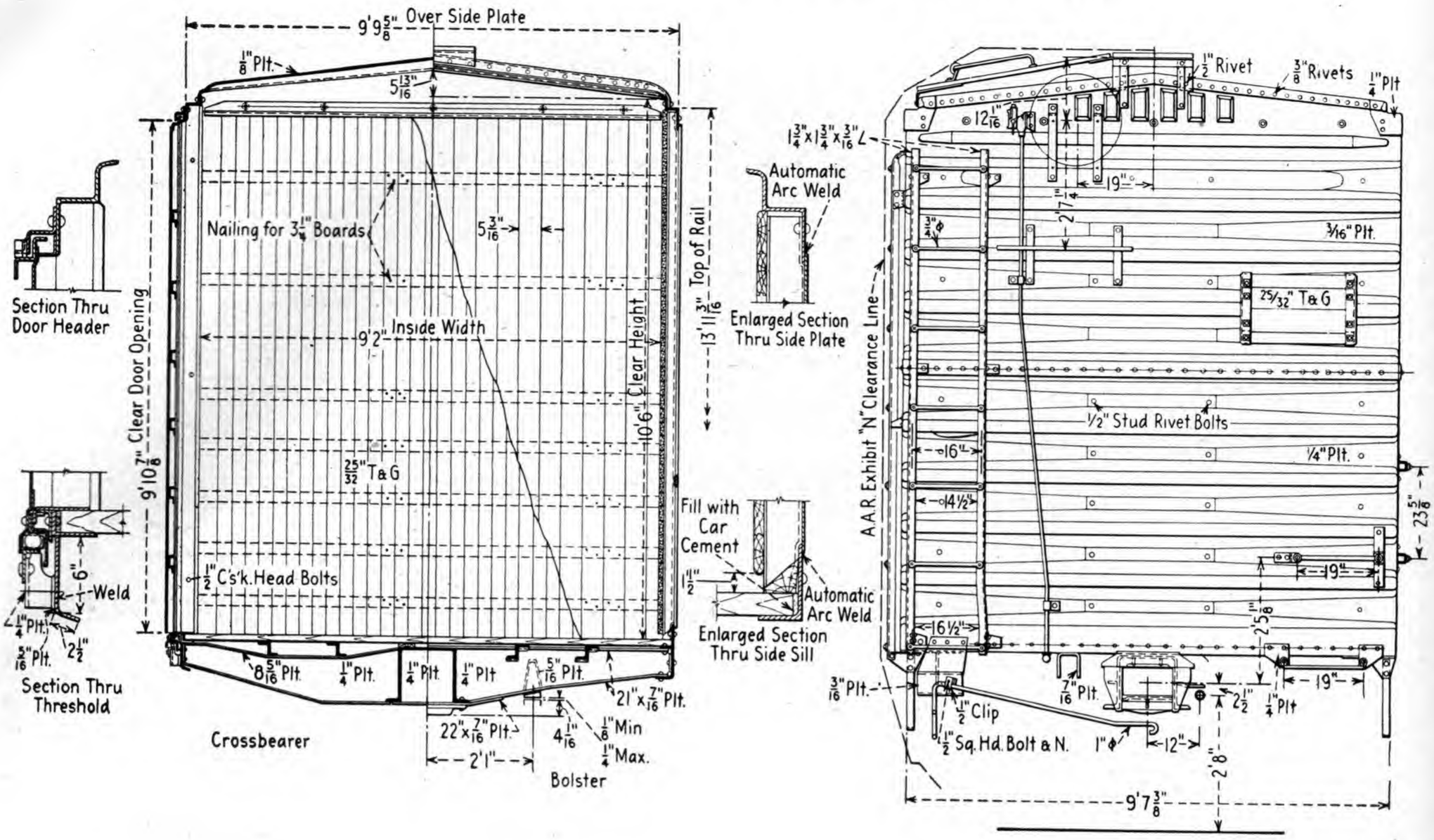
Inside length, 40 ft. 6 in.; width, 9 ft. 2 in.; height, 8 ft. 6 in.; capacity, 3,180 cu. ft.; light weight, 45,300 lb.; door opening, 12 ft.

Pennsylvania 50-ton, 60 ft. 6 in., all-welded, high-tensile steel merchandise box car equipped with Steins load retainer. Road Class X40B. Built at Altoona Works

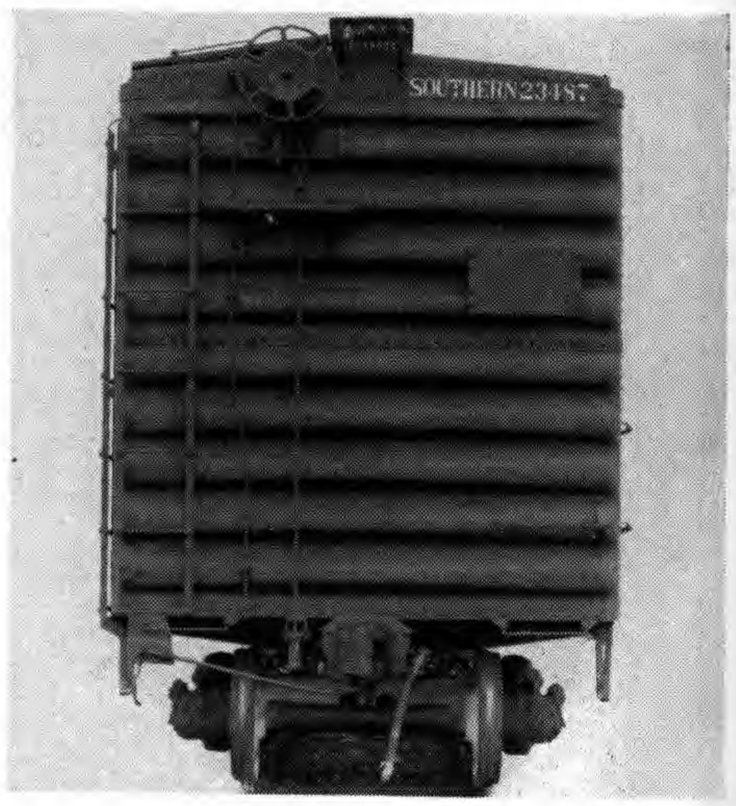
Inside length, 60 ft. 6 in.; width, 9 ft. 1 in.; height, 10 ft. 8⅜ in.; capacity, 5,879 cu. ft.; light weight, 54,700 lb.; trucks have high-tensile steel bolster and side frames, 3 3/16 in. travel springs controlled by built-in snubbing device.



Plan and elevation of the 50-ton, 40 ft. 6 in. PS-1 box car built by the Pullman-Standard Car Manufacturing Co.



Above—Cross section and end elevation of PS-1 box car built by the Pullman-Standard Car Manufacturing Co.



Right—End view of PS-1 car shown below.

Below—Southern car of PS-1 design.

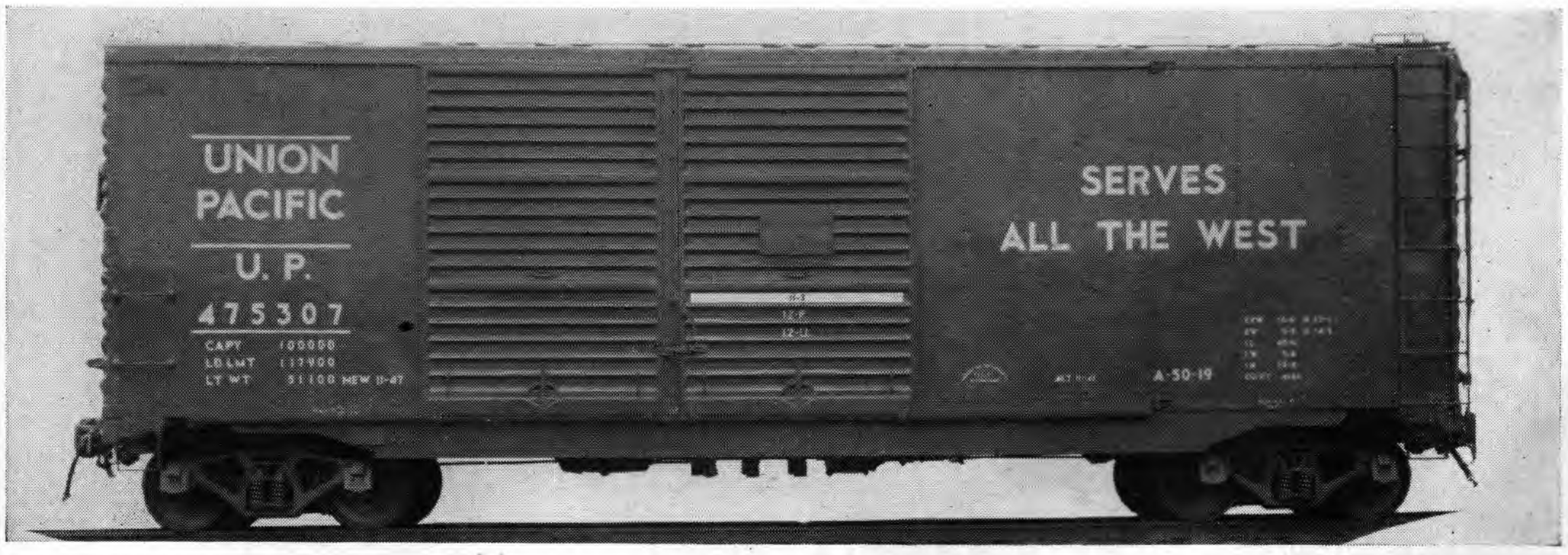
Inside length 40 ft. 6 in.; width, 9 ft. 2 in.; height, 10 ft. 6 in.; capacity, 3,898 cu. ft.; light weight, 47,100 lb.; load limit, 121,900 lb.

Baltimore & Ohio 50-ton, 40 ft. 6 in., steel-sheathed automobile box car. Equipped with Duryea Cushion Underframe. Road Class M-59. Builder, Pressed Steel Car Co., Inc.

Inside, length, 40 ft. 6 in.; width, 9 ft. 2 in.; height, 10 ft. 6 in.; capacity, 3,898 cu. ft.; door opening, 14 ft. 0 in.; light weight, 49,400 lb.; load limit, 119,600 lb.

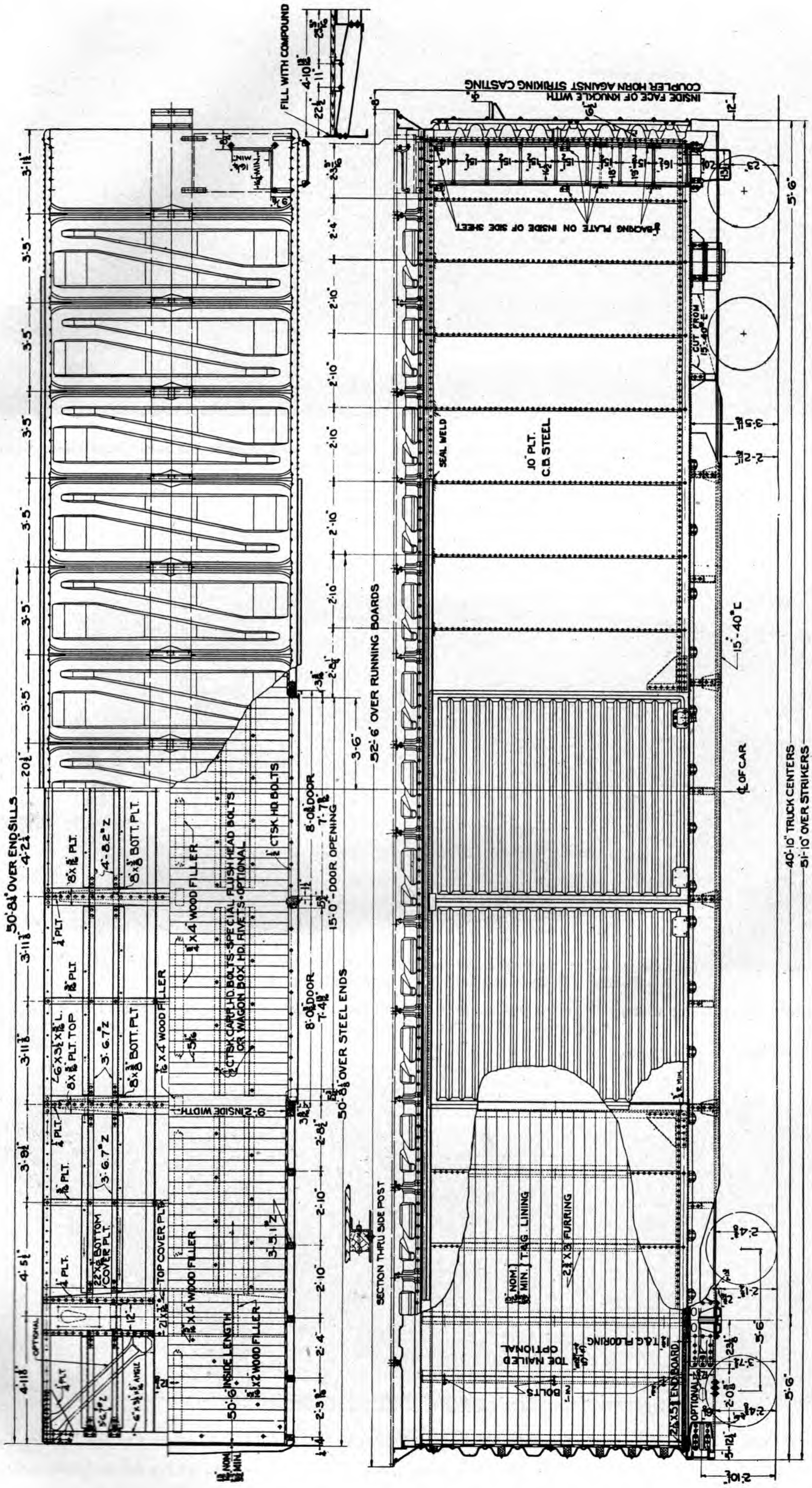
Seaboard Air Line 50-ton, 40 ft. 6 in., steel-sheathed furniture and automobile box car. Road Class AF-4. Builder, Pullman-Standard Car Manufacturing Co.

Inside, length, 40 ft. 6 in.; width, 9 ft. 2 in.; height, 10 ft. 6 in.; capacity, 3,901 cu. ft.; door opening, 14 ft. 0 in.; light weight, 48,000 lb.; load limit, 121,000 lb.



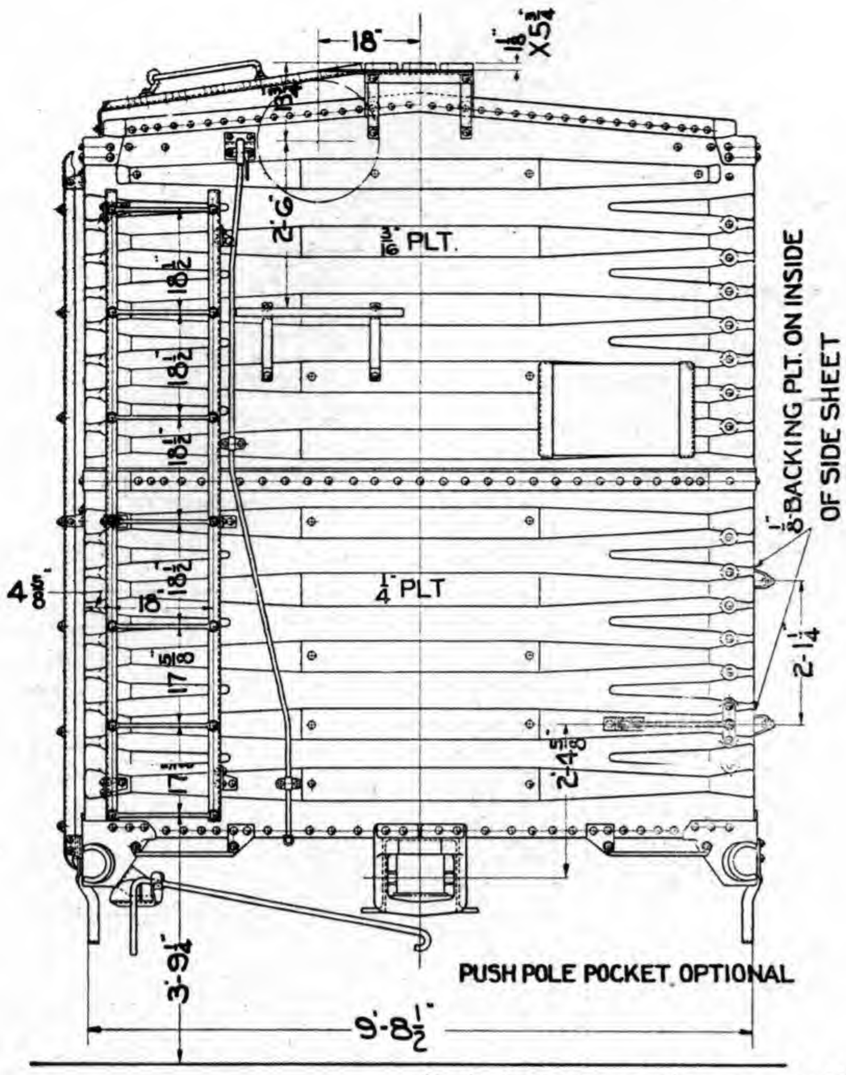
Union Pacific 50-ton, 40 ft. 6 in., steel-sheathed automobile box car. Road Class A-50-19. Builder, American Car and Foundry Company.

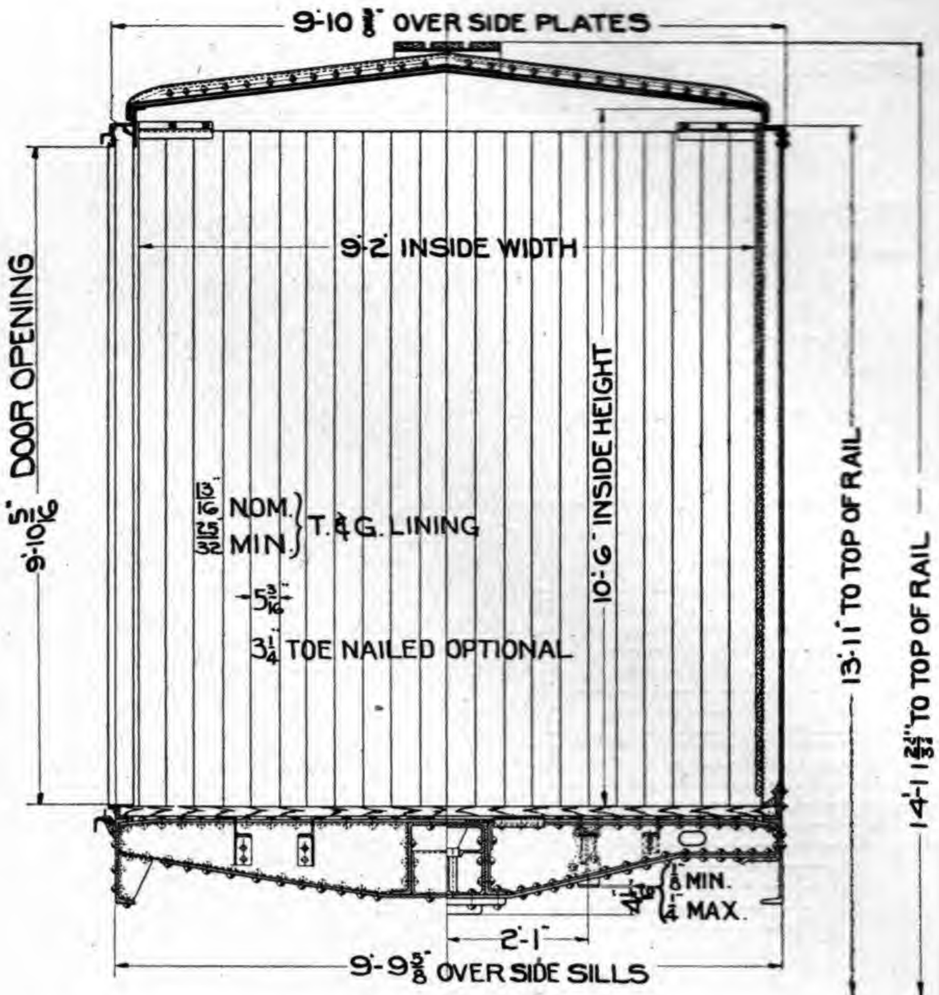
Inside, length, 40 ft. 6 in.; width, 9 ft. 6 in.; height, 10 ft. 8 in.; capacity, 4,106 cu. ft.; light weight, 51,100 lb.; load limit, 117,900 lb.



A. A. R. Standard 50-ton, 50 ft. 6 in., steel-sheathed automobile box car.

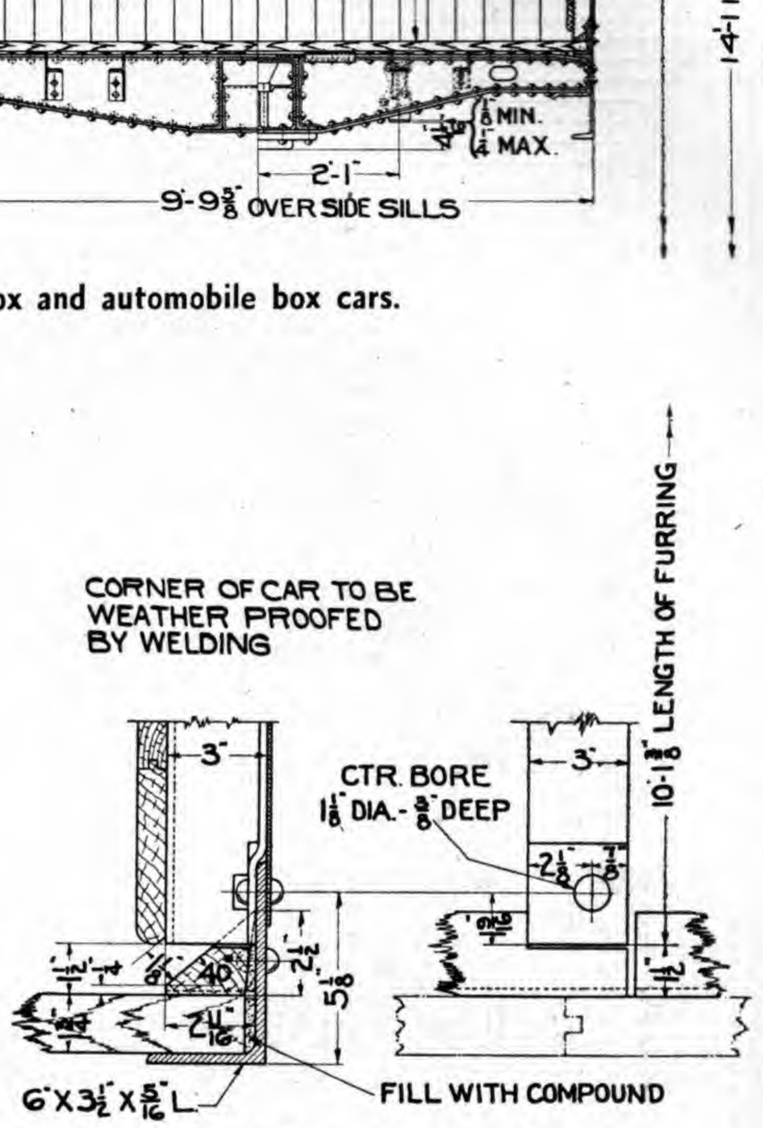
Capacity, 4,950 cu. ft.; inside, length 50 ft. 6 in.; width 9 ft. 2 in.; height at eaves 10 ft. 6 in.; door opening, 15 ft. 0 in. Double end doors in one end optional.
(*From A.A.R. Supplement to Manual, Plate* 1528—*For end elevation and cross sections see Page* 183.)



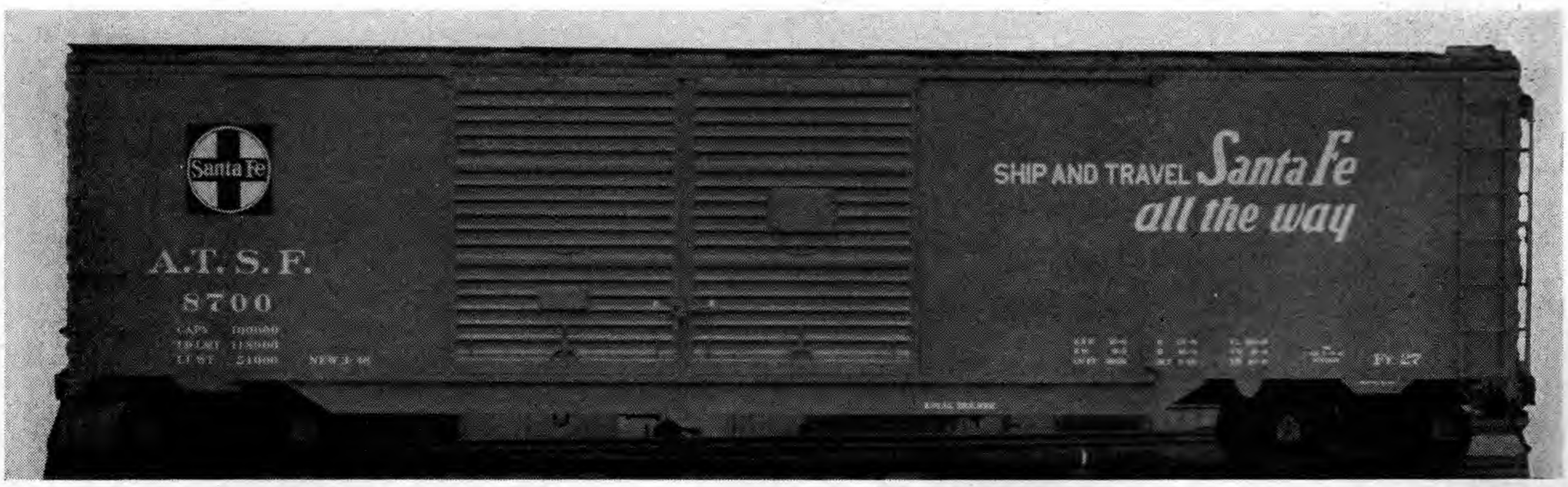


End elevation and cross section of A. A. R. 50 ft. 6 in. box and automobile box cars.

End view of Grand Trunk Western automobile box car equipped with end doors.

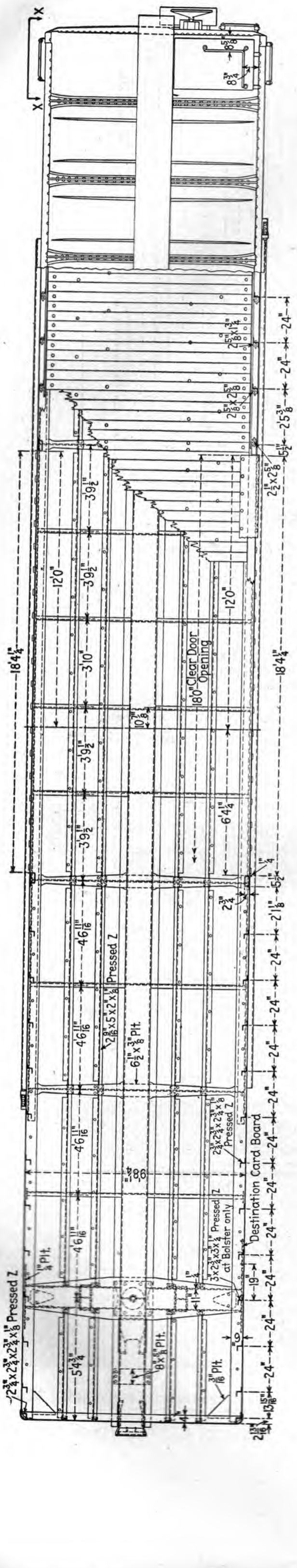

CORNER OF CAR TO BE WEATHER PROOFED BY WELDING
3"
CTR. BORE 1⅛" DIA. - ⅜" DEEP
10-1⅜" LENGTH OF FURRING
6" X 3½" X 5/16" L
FILL WITH COMPOUND
SECTION SHOWING CUT IN SIDE NAILING, FURRING & GRAIN STRIP

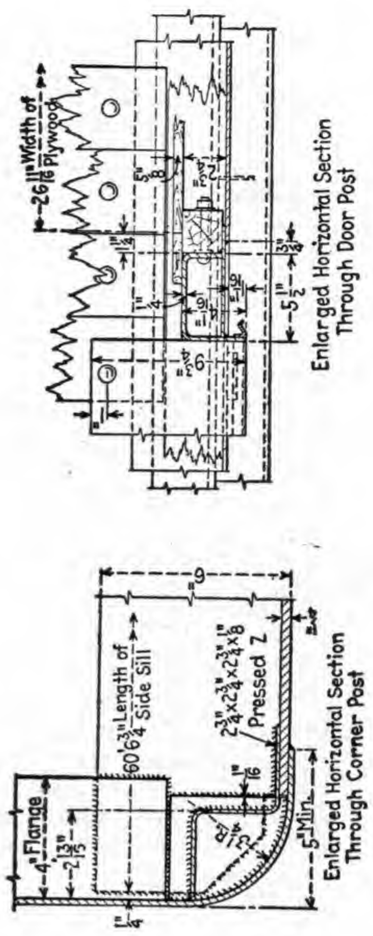
Details of A. A. R. 50 ft. 6 in. box and automobile box cars.



Atchison, Topeka & Santa Fe 50-ton, 50 ft. 6 in. automobile box car, Road Class FE-27. Builder, Mt. Vernon Car Manufacturing Division, Pressed Steel Car Co., Inc.

Inside, length 50 ft. 6 in.; width 9 ft. 4 in.; height 10 ft. 6 in.; capacity 4,954 cu. ft.; light weight 51,000 lb.; load limit 118,000 lb.

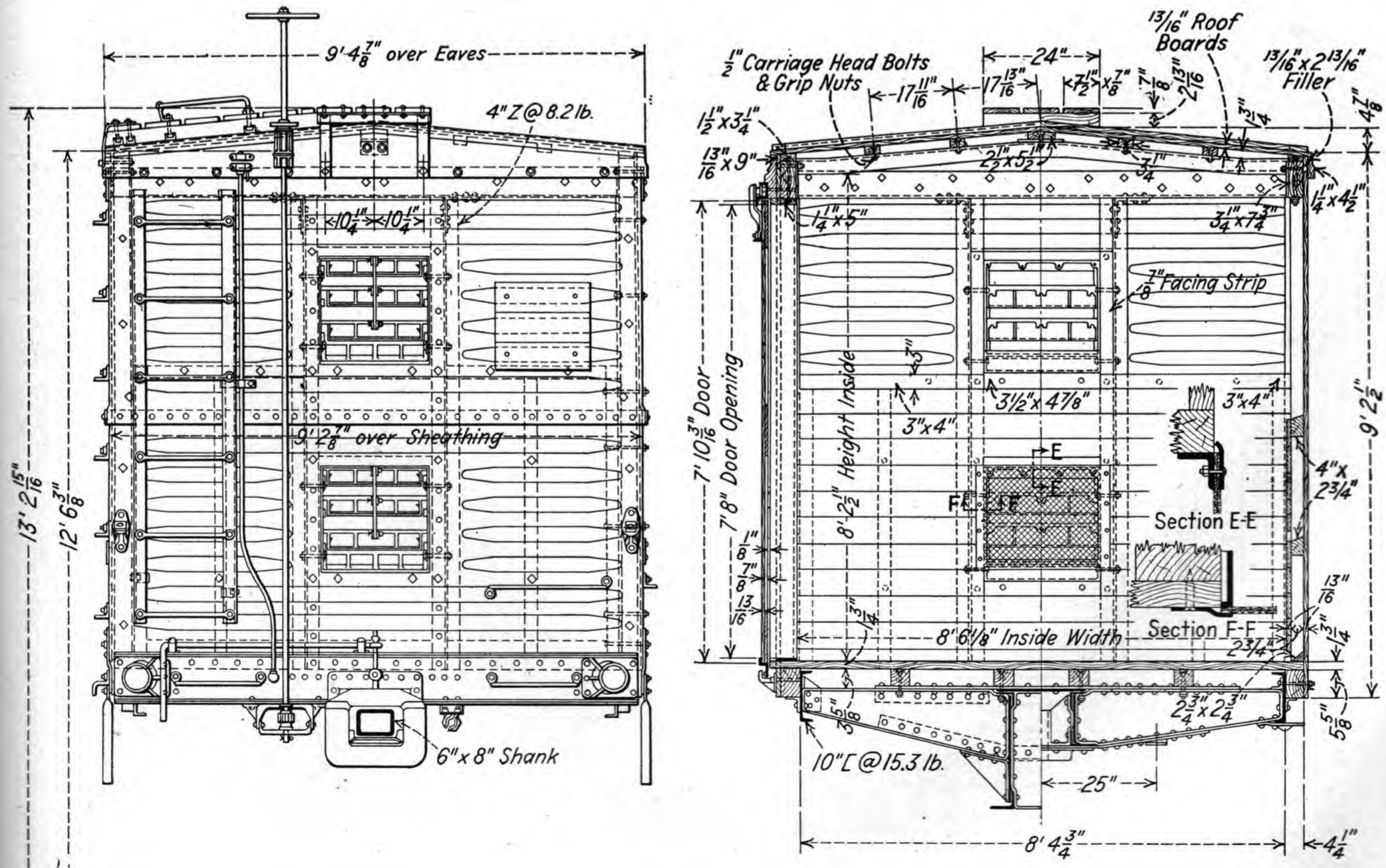




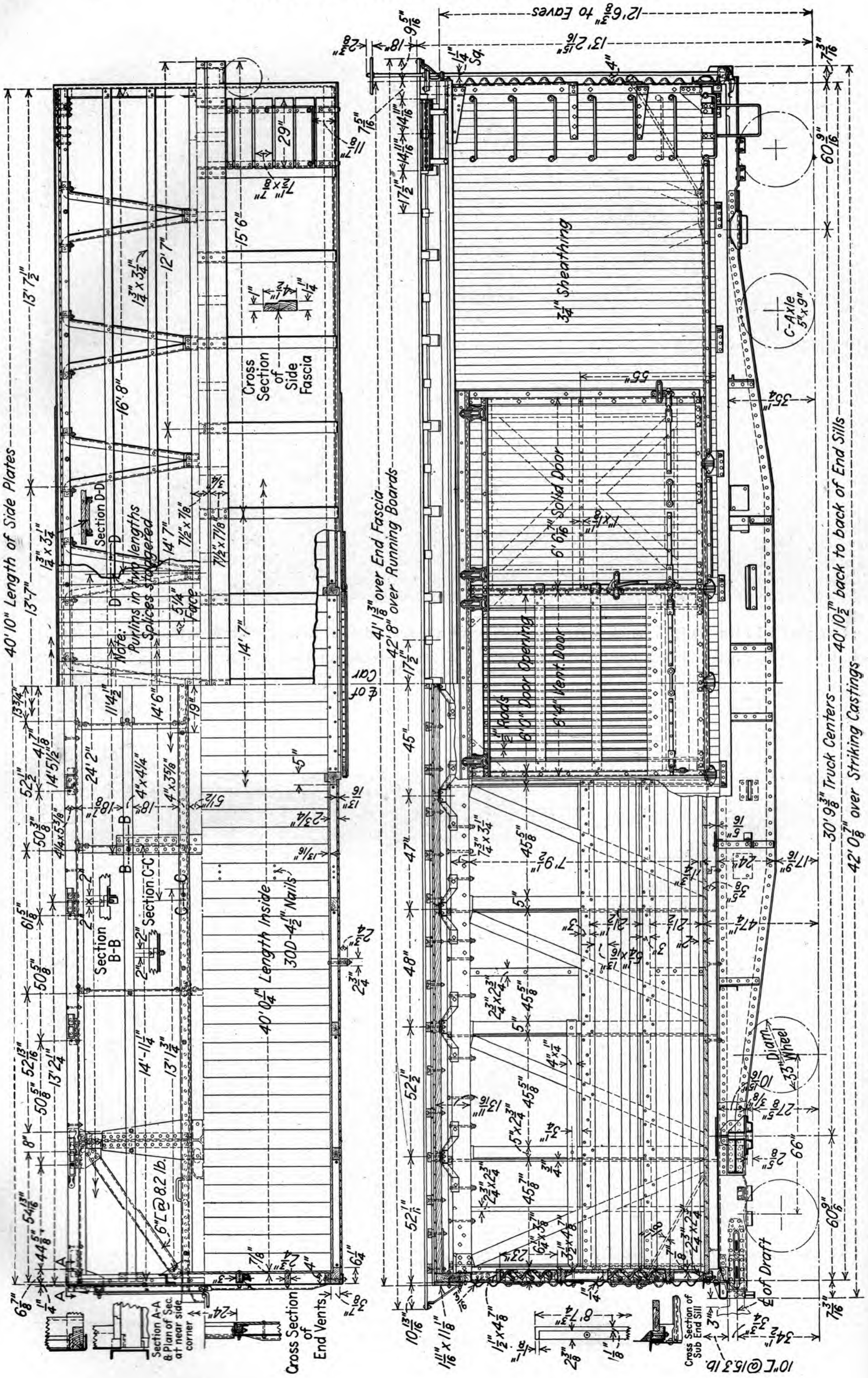
Plan, elevation and sections of Pennsylvania Railroad 50-ton, 60 ft. 6 in. automobile box car, Railroad Class X-40. Built at railroad shops. Capacity, 8,487 cu. ft.; inside, length, 60 ft. 6 in.; width, 9 ft. 1 in.; height at eaves 10 ft. 8⅜ in.; light weight (estimated), 49,400 lb.

Pennsylvania 50-ton, 60 ft. 6 in. all-welded automobile box car, Railroad Class X-40. Builder, P. R. R. Altoona Works.

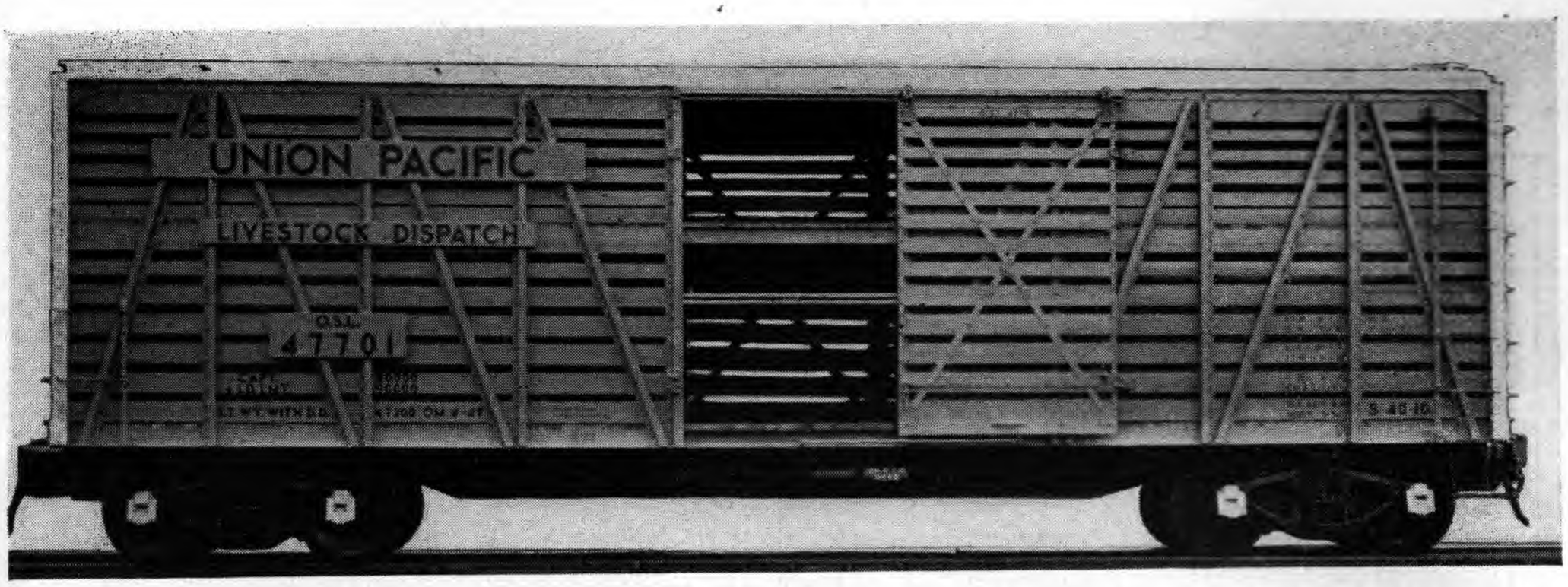
Inside, length 60 ft. 6 in.; width 9 ft. 1 in.; height 10 ft. 8⅜ in.; capacity 5,879 cu. ft.; door width 18 ft. 0 in.; light weight 49,200 lb.; load limit 119,800 lb.



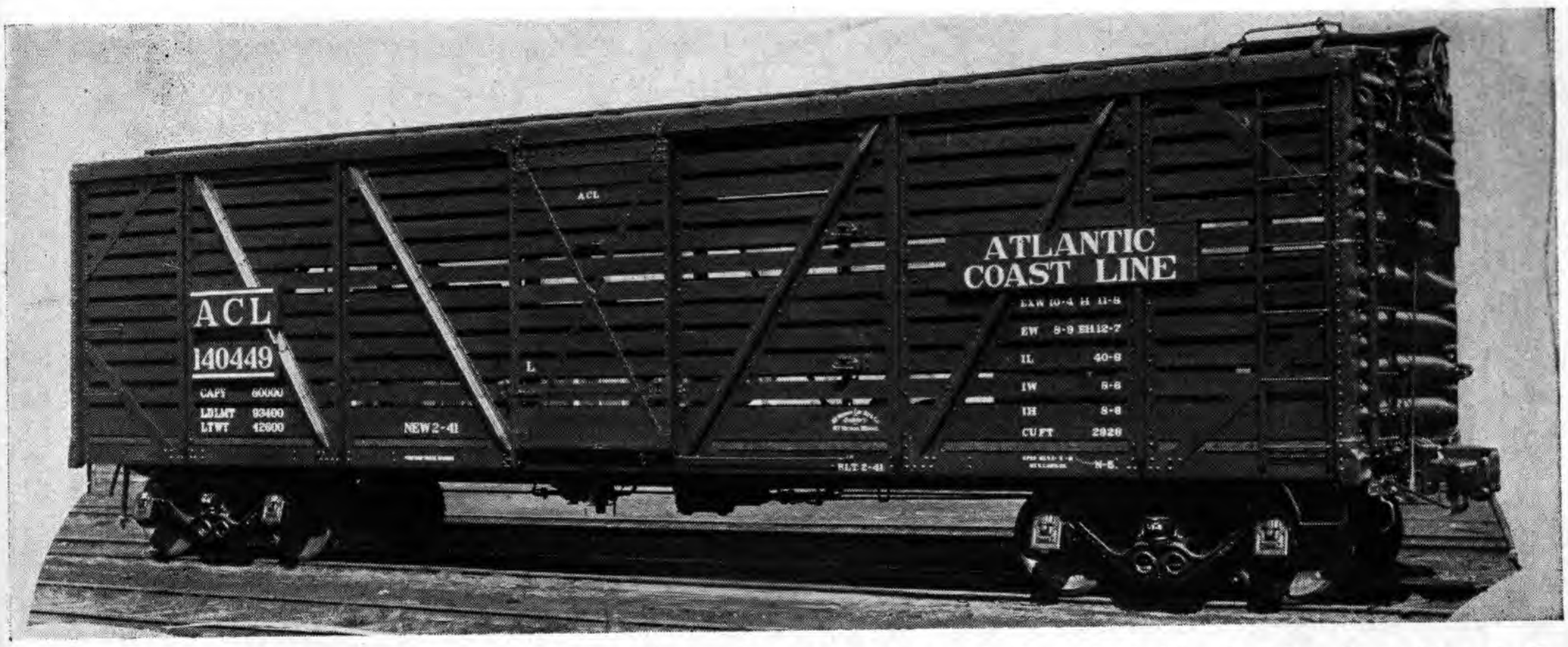
End elevation and cross-sections of Central of Georgia 40-ton ventilated box car.



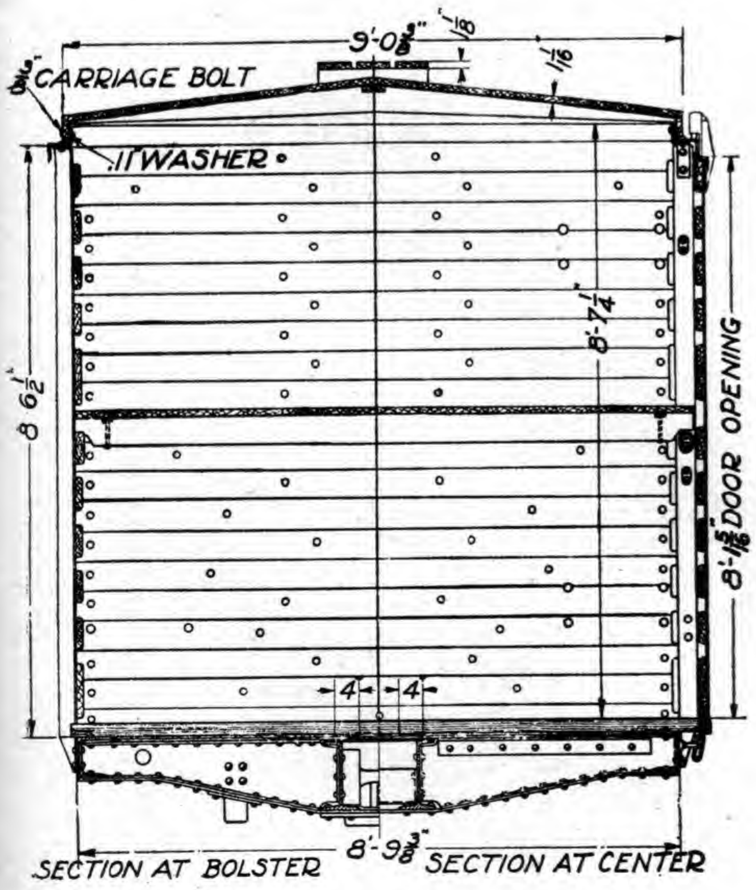
Plan and elevation of Central of Georgia 40-ton double-sheathed, steel underframe ventilated box car. A. A. R. Class VA.

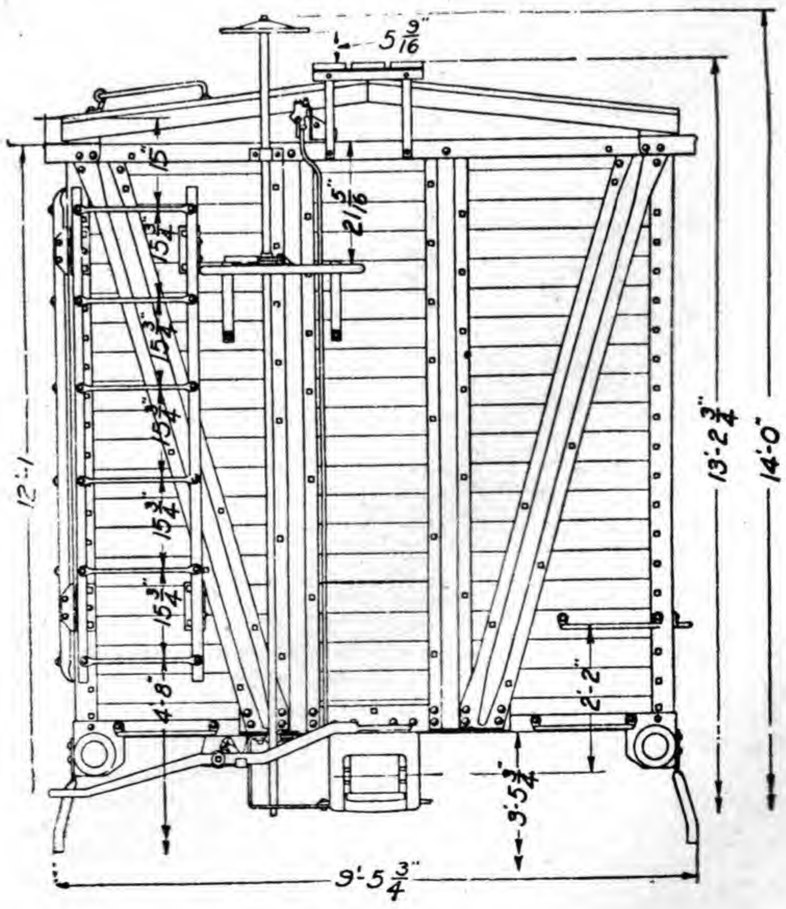


Union Pacific 40-ton double-deck stock car. Road Class S-40-10. Equipped with Timken roller bearing trucks. Rebuilt at railroad shops, Omaha. Roof and sides painted aluminum, underframe and trucks black, sides yellow with bright red lettering and figures.
Inside, length 40 ft. 7 in.; width 8 ft. 10 in.; height 9 ft. 2 in.; capacity 3,292 cu. ft.; light weight (double deck) 47,200 lb.; load limit 90,000 lb.

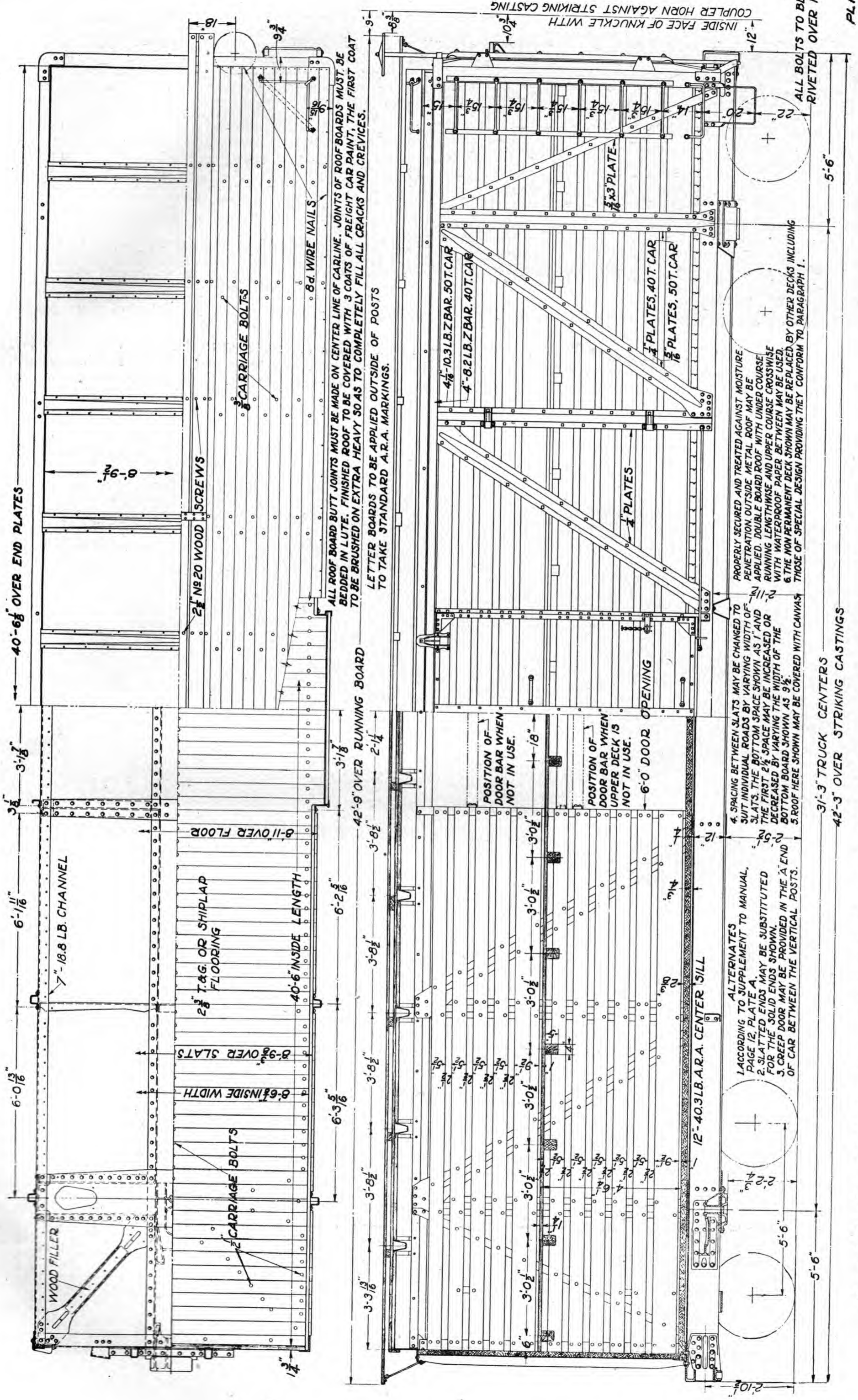


Atlantic Coast Line 40-ton steel-frame, single-deck stock car, Road Class N5. A. A. R. Class SM. Builder, American Car and Foundry Co.
Capacity, 2,926 cu. ft.; light weight, 42,600 lb.; load limit, 93,400 lb.; inside length, 40 ft. 6 in.; inside width, 8 ft. 6 in.; inside height, 8 ft. 6 in.





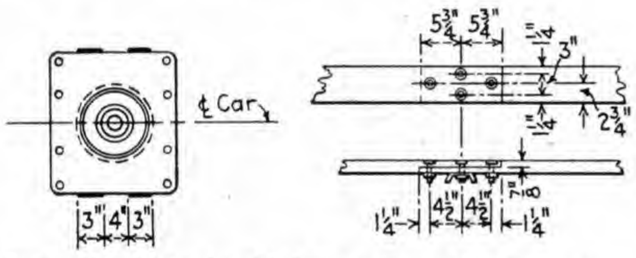
Cross section and end elevation of A. A. R. recommended practice stock cars show non Page 190.


PL 103
ALL BOLTS TO BE RIVETED OVER NUTS.
INSIDE FACE OF KNUCKLE WITH COUPLER HORN AGAINST STRIKING CASTING
40'-6⅜" OVER END PLATES
42'-9" OVER RUNNING BOARD
42'-3" OVER STRIKING CASTINGS
40'-6" INSIDE LENGTH
8'-11" OVER FLOOR
8'-9⅜" OVER SLATS
8'-6¾" INSIDE WIDTH
2¾" T.&G. OR SHIPLAP FLOORING
7"-18.8 LB. CHANNEL
2½" Nº 20 WOOD SCREWS
⅝" CARRIAGE BOLTS
8d. WIRE NAILS
ALL ROOF BOARD BUTT JOINTS MUST BE MADE ON CENTER LINE OF CARLINE. JOINTS OF ROOF BOARDS MUST BE BEDDED IN LUTE. FINISHED ROOF TO BE COVERED WITH 3 COATS OF FREIGHT CAR PAINT, THE FIRST COAT TO BE BRUSHED ON EXTRA HEAVY SO AS TO COMPLETELY FILL ALL CRACKS AND CREVICES.
LETTER BOARDS TO BE APPLIED OUTSIDE OF POSTS TO TAKE STANDARD A.R.A. MARKINGS.
WOOD FILLER
⅝" CARRIAGE BOLTS
13¾"
4½"-10.3 LB. Z BAR. 50 T. CAR
4"-8.2 LB. Z BAR. 40 T. CAR
1" PLATES
1" PLATES, 40 T. CAR
⅝" PLATES, 50 T. CAR
⅝"x3" PLATE
POSITION OF DOOR BAR WHEN NOT IN USE.
POSITION OF DOOR BAR WHEN UPPER DECK IS NOT IN USE.
6'-0" DOOR OPENING
12'-40.3 LB. A.R.A. CENTER SILL
ALTERNATES
1. ACCORDING TO SUPPLEMENT TO MANUAL, PAGE 12, PLATE A.
2. SLATTED ENDS MAY BE SUBSTITUTED FOR THE SOLID ENDS SHOWN.
3. CREEP DOOR MAY BE PROVIDED IN THE A END OF CAR BETWEEN THE VERTICAL POSTS.
4. SPACING BETWEEN SLATS MAY BE CHANGED TO SUIT INDIVIDUAL ROADS BY VARYING WIDTH OF SLATS. THE BOTTOM SPACE SHOWN AS 1" AND THE FIRST 2½" SPACE MAY BE INCREASED OR DECREASED BY VARYING THE WIDTH OF THE BOTTOM BOARD SHOWN AS 9½".
5. ROOF HERE SHOWN MAY BE COVERED WITH CANVAS PROPERLY SECURED AND TREATED AGAINST MOISTURE PENETRATION. OUTSIDE METAL ROOF MAY BE APPLIED. DOUBLE BOARD ROOF WITH UNDER COURSE RUNNING LENGTHWISE AND UPPER COURSE CROSSWISE WITH WATERPROOF PAPER BETWEEN MAY BE USED.
6. THE NON PERMANENT DECK SHOWN MAY BE REPLACED BY OTHER DECKS INCLUDING THOSE OF SPECIAL DESIGN PROVIDING THEY CONFORM TO PARAGRAPH 1.

Plan and elevation of A. A. R. recommended practice 40-ton and 50-ton steel-frame, single-sheathed, stock car, convertible single or double deck, Classes 4C-SC-1 and 4D-SC-1.
Based on design of recommended practice single-sheathed box cars.
(From A. A. R. Supplement to Manual, Plate 103)

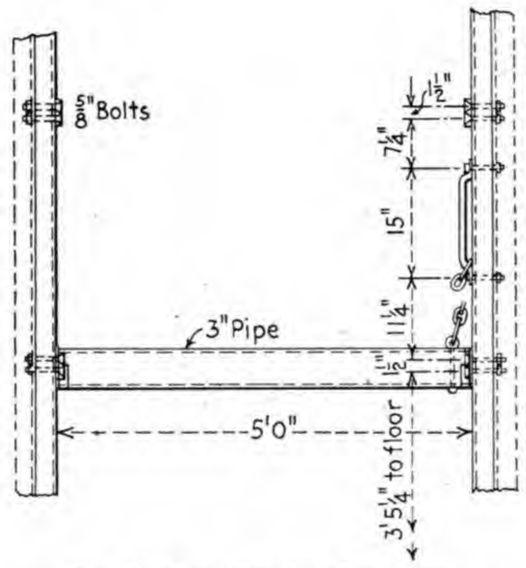
Missouri Pacific Lines (I.-G. N.) 40-ton single-deck stock car. Builder, American Car and Foundry Co.

Inside, length 40 ft. ½ in.; width 8 ft. 6¾ in.; height 8 ft. 10 in.; capacity, 2,947 cu. ft.; light weight, 43,900 lb. load limit, 92,100 lb.
(*See also Page* 190)

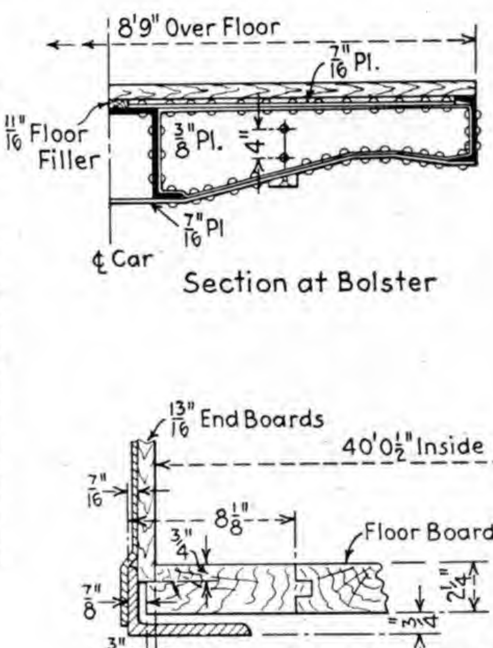


Plan View of Body Center Plate
Showing location of welds
to bolster bottom plate

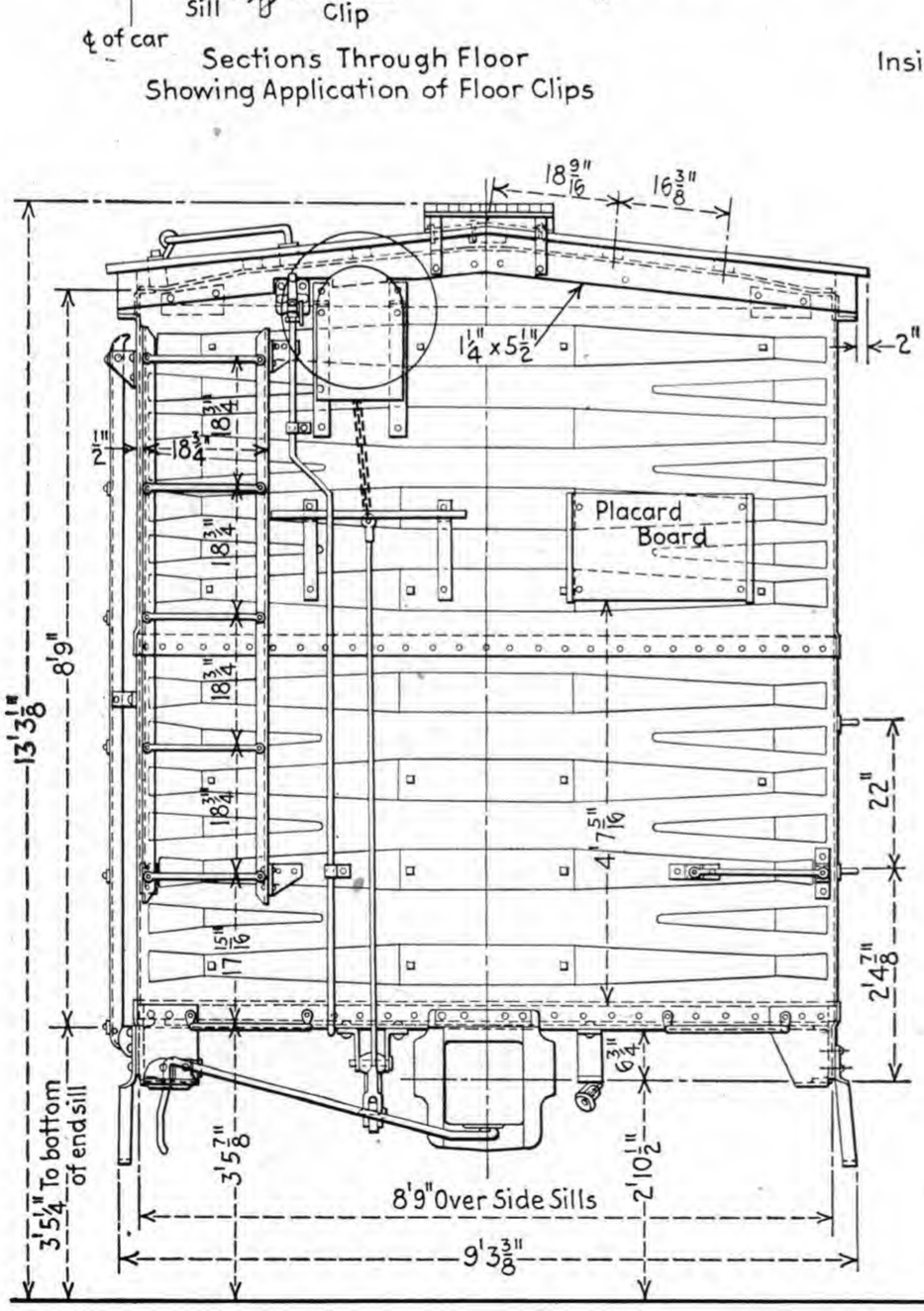
Bolt Application at
Ridge Pole Splice



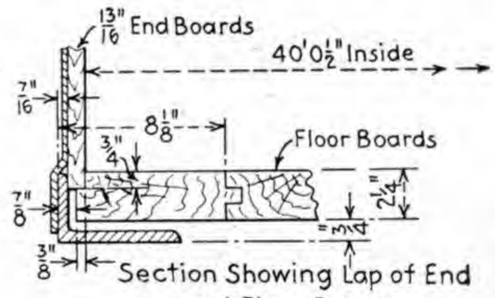
Inside View Showing Bull Bar
in Position



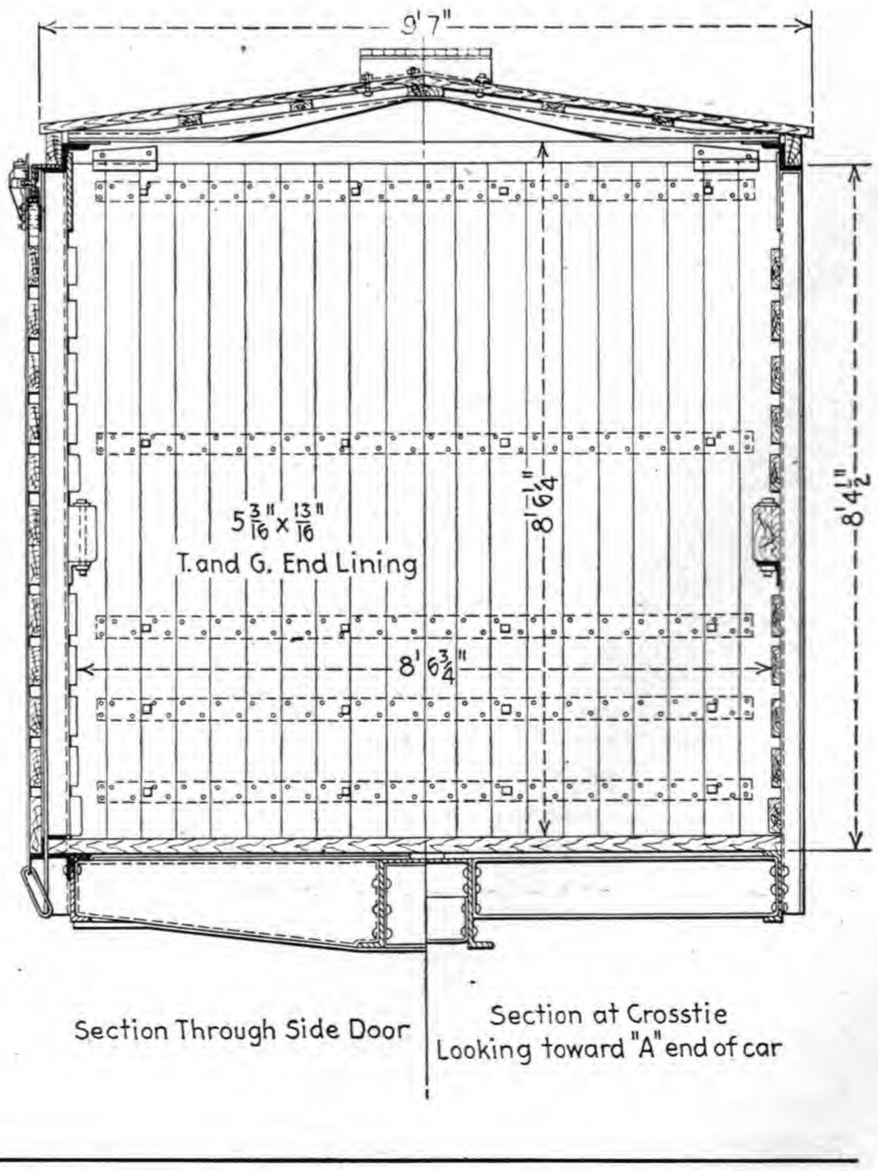
Section at Bolster



Sections Through Floor
Showing Application of Floor Clips



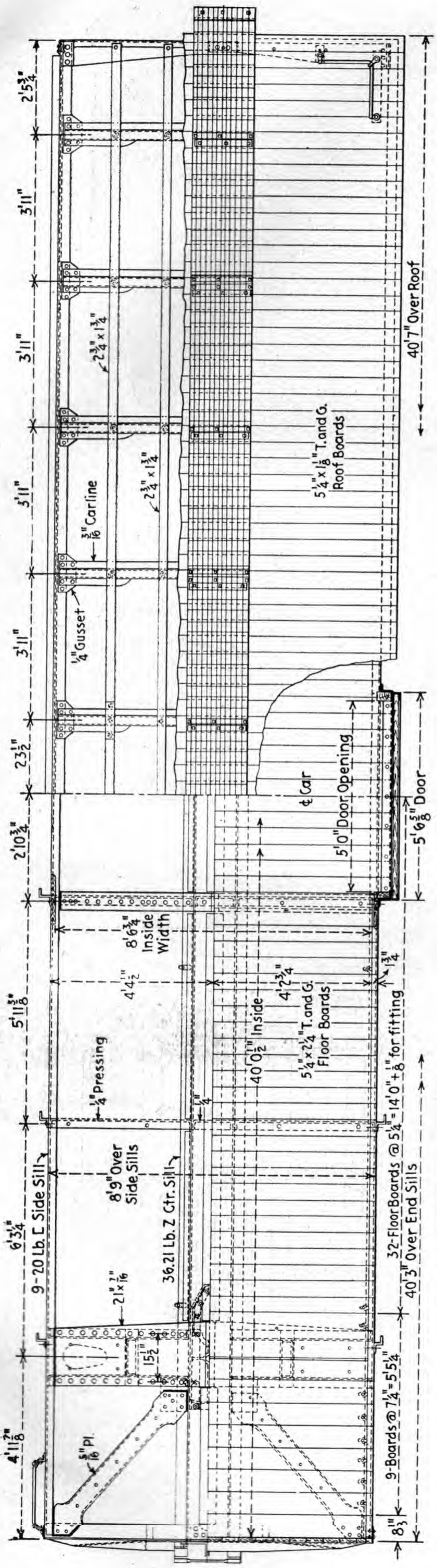
Section Showing Lap of End
and Floor Boards



Section Through Side Door

Section at Crosstie
Looking toward "A" end of car

End elevation, cross section and details of Missouri Pacific stock car. (Page 192)



Plan, elevation and details of Missouri Pacific 40-ton single-deck stock car A. A. R. Class SM. Built by the American Car and Foundry Company.

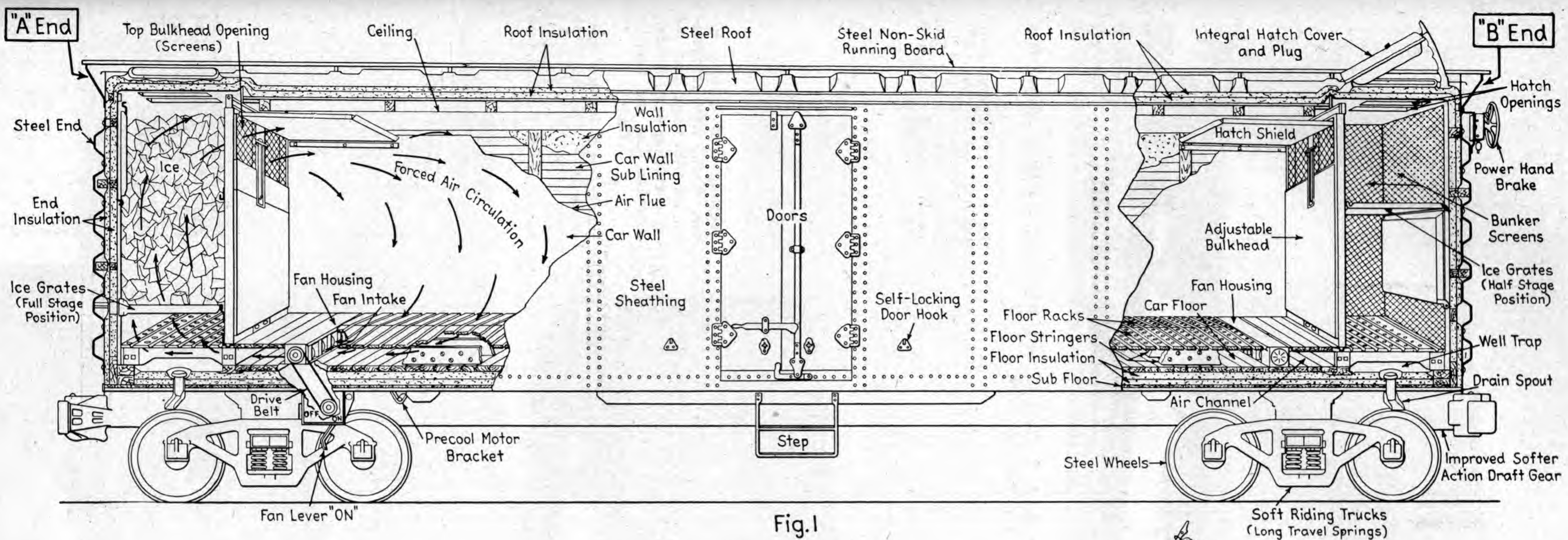


Fig. 1

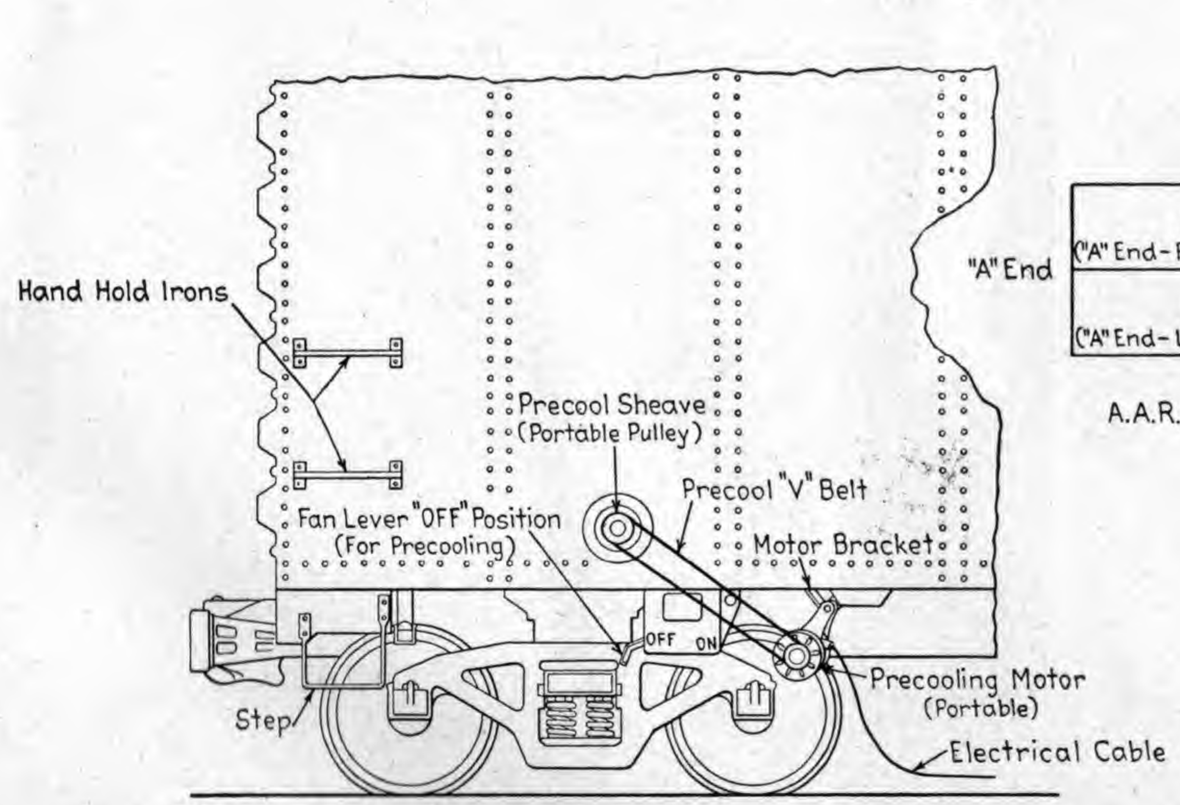


Fig. 2

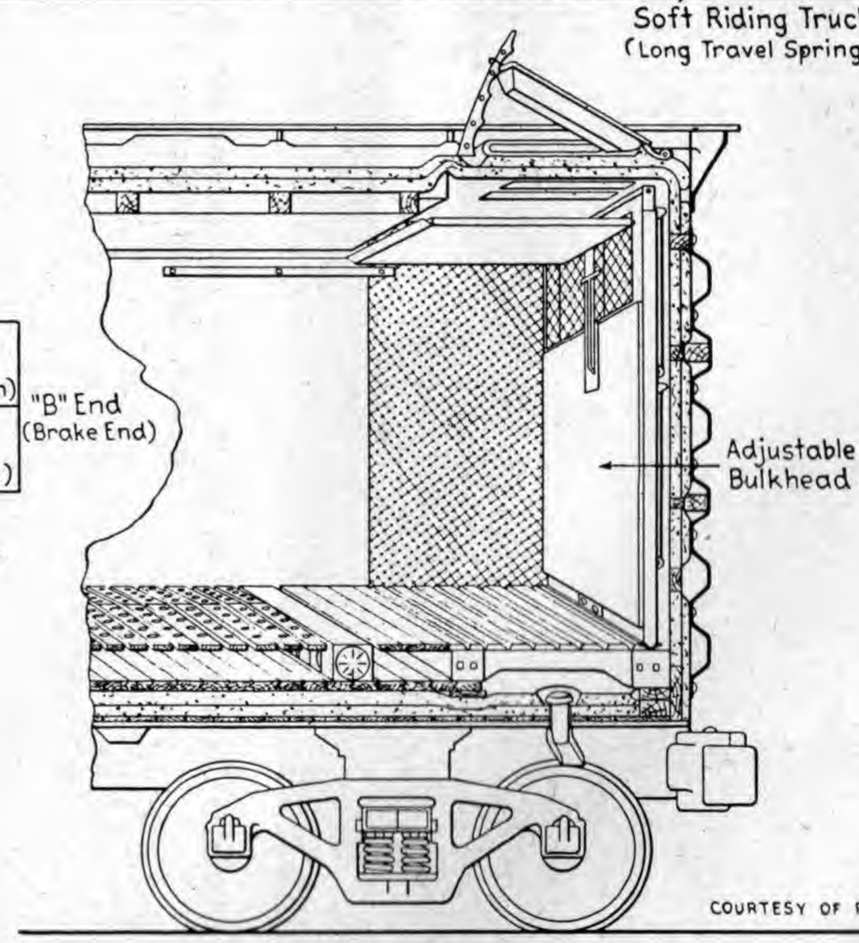
(Right)

AR ("A" End - Right Section)	BR ("B" End - Right Section)
AL ("A" End - Left Section)	BL ("B" End - Left Section)

(Left)

"B" End (Brake End)

A.A.R. — Identification of Car Sections

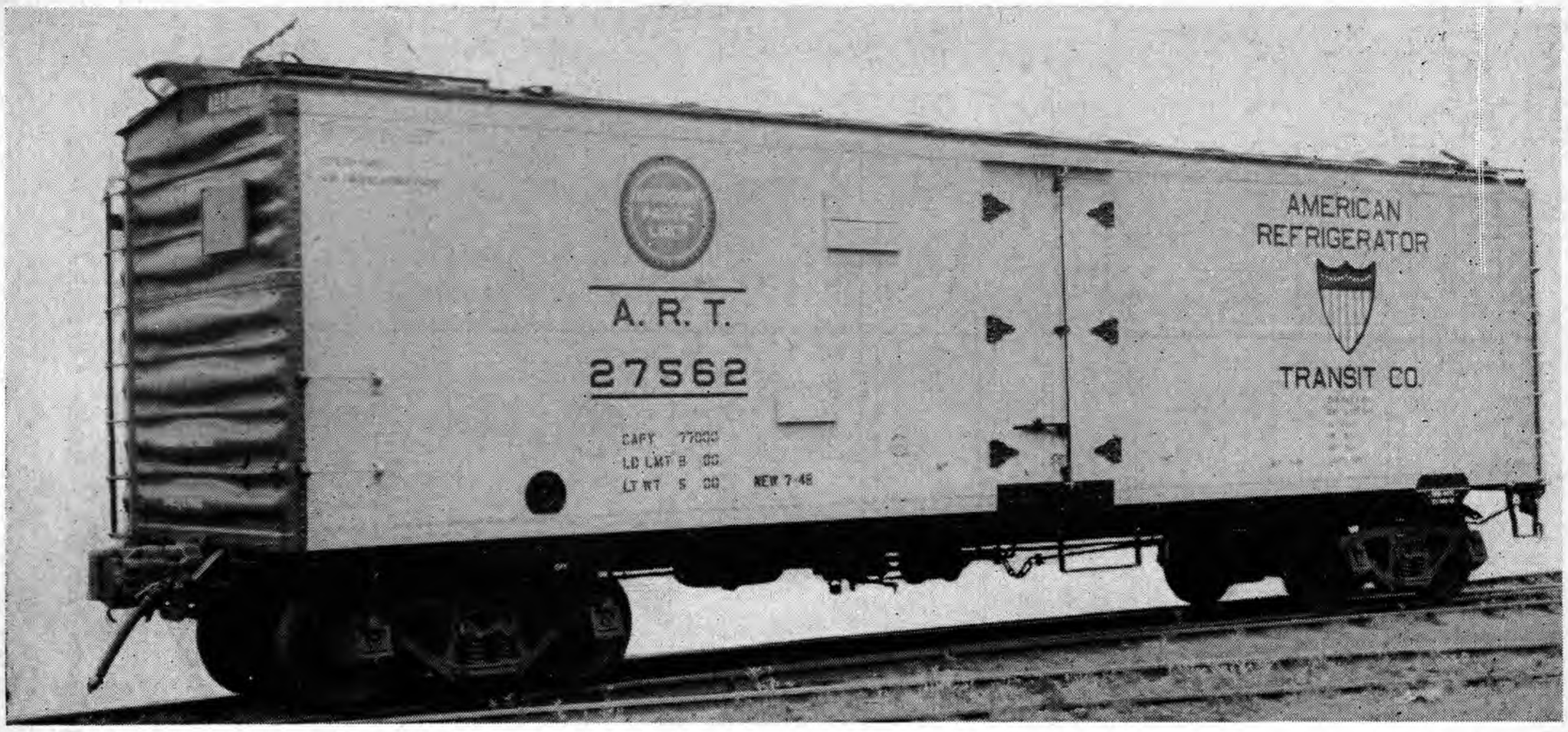


COURTESY OF PRECO INCORPORATED, LOS ANGELES, CALIF.

Fig. 3

Design for a modern ventilated refrigerator car recommended by the refrigerator car committee of the United Fresh Fruit and Vegetable Association. Stage icing—adjustable bulkheads—forced air circulation.

Description: *Railway Age*, October 28, 1944



American Refrigerator Transit, 40-ton, 40-ft., steel refrigerator car, A. A. R. Class RS with stage icing and air circulating fans. Builder, General American Transportation Corp.

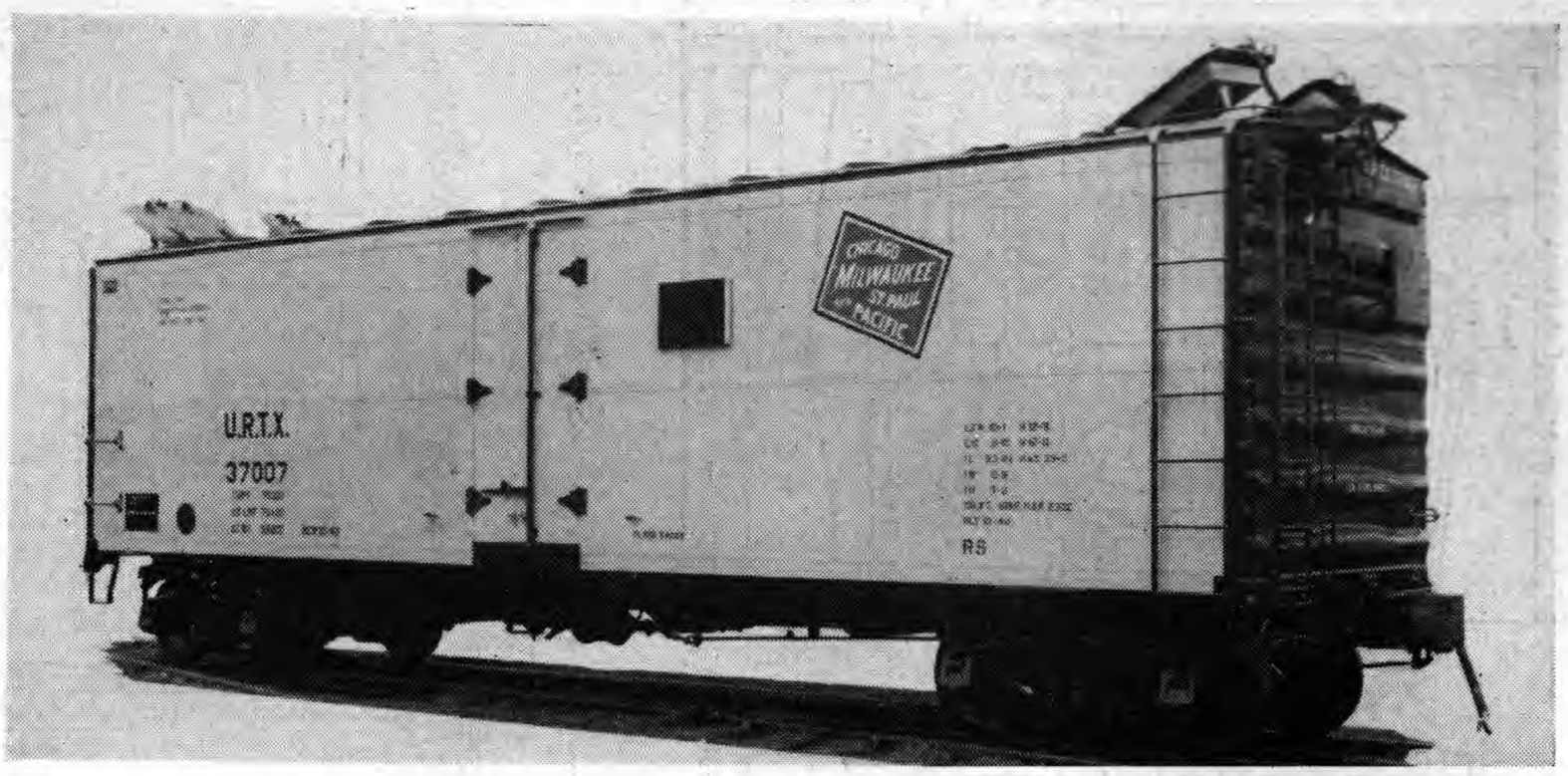
Inside length between bulkheads 33 ft. 2¾ in.; width 8 ft. 3 in.; height 7 ft. 3 in.; capacity 1,988 cu. ft.; light weight 56,500 lb.; load limit 79,500 lb.

Western Fruit Express, 40-ton, 40-ft., steel refrigerator car with stage icing and air circulating fans. Builder, American Car and Foundry Co.

Inside length between bulkheads 33 ft. 2¾ in.; width 8 ft. 3 in.; height 7 ft. 3 in.; capacity 1,988 cu. ft.; light weight 56,800 lb.; load limit 77,000 lb.

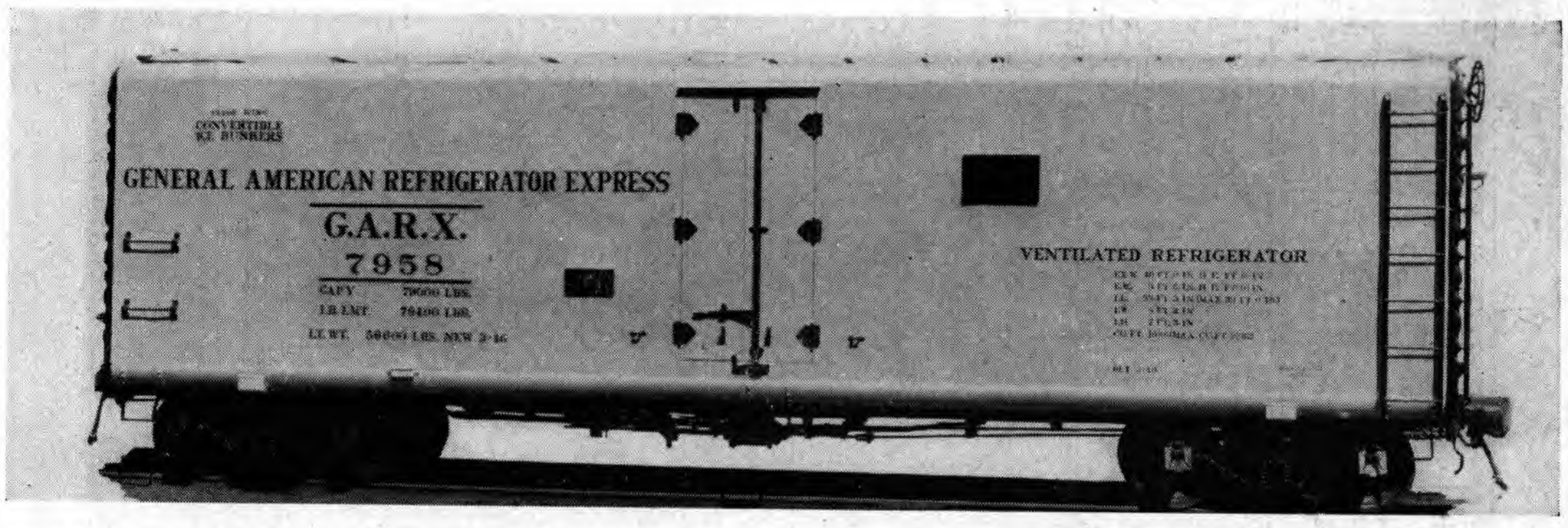
Merchants Despatch Transportation Corp. 35-ton steel refrigerator car with stage icing and air circulating fans. Builder, Despatch Shops, Inc.

Inside length between bulkheads 33 ft. 2¾ in.; width 7 ft. 3 3/16 in.; height 7 ft. 3 3/16 in.; capacity 1,992 cu. ft.; ice tanks 281 cu. ft.; capacity 11,600 lb. crushed ice; light weight 59,400 lb.; load limit 76,600 lb.



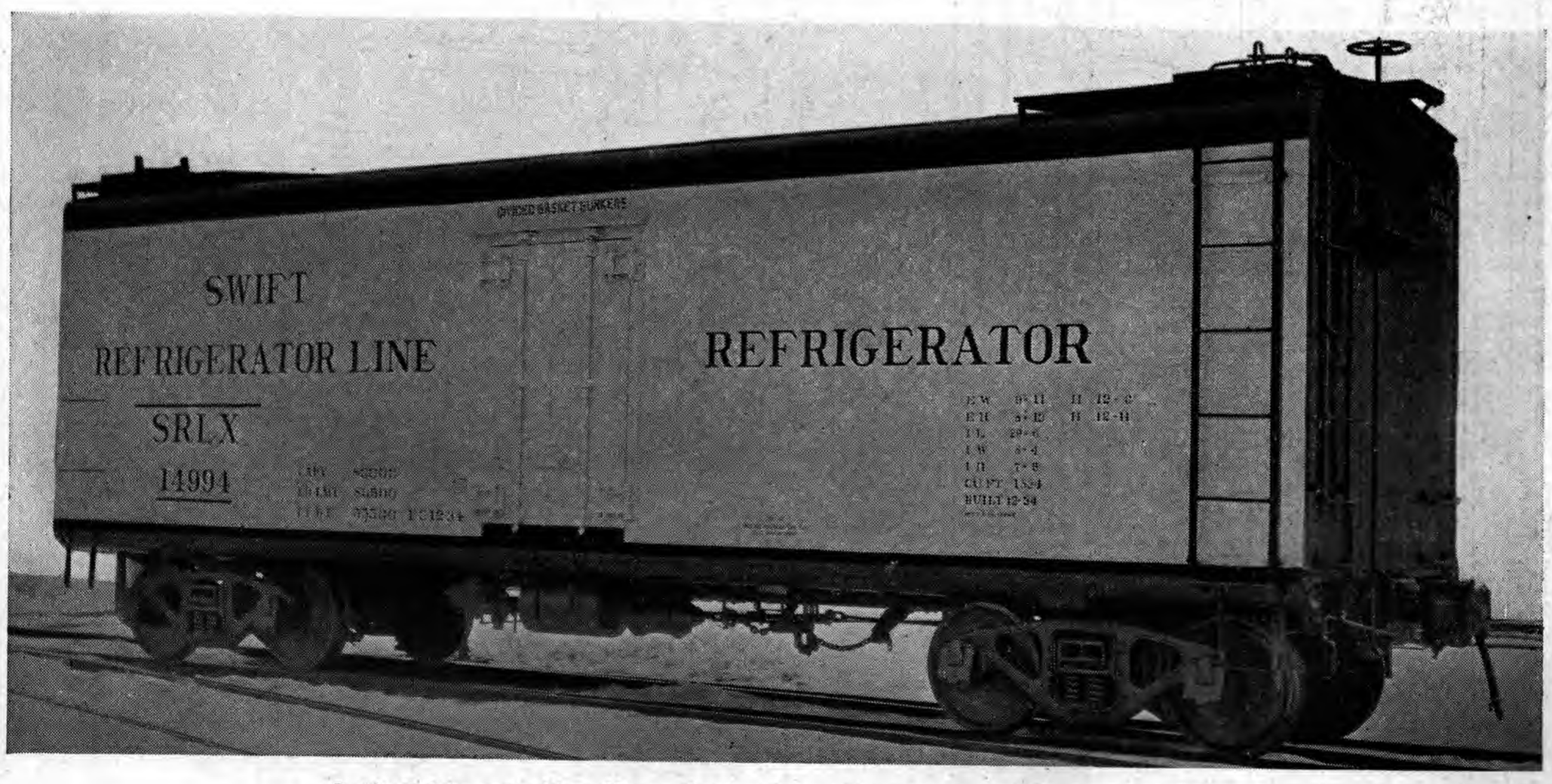
Union Refrigerator Transit Lines 75,000-lb. capacity refrigerator car with stage icing, convertible bunkers and air circulating fans.

Inside length between bulkheads 33 ft. 2¾ in., bulkheads collapsed 39 ft. 0 in.; width 8 ft. 3 in.; height 7 ft. 3 in.; capacity 1,988 or 2,330 cu. ft.; light weight 56,900 lb.; load limit 79,100 lb.



General American Refrigerator Express 40-ft., 40-ton, steel refrigerator car with Duryea Cushion Underframe, stage icing, and convertible bunkers; A. A. R. Class RS.

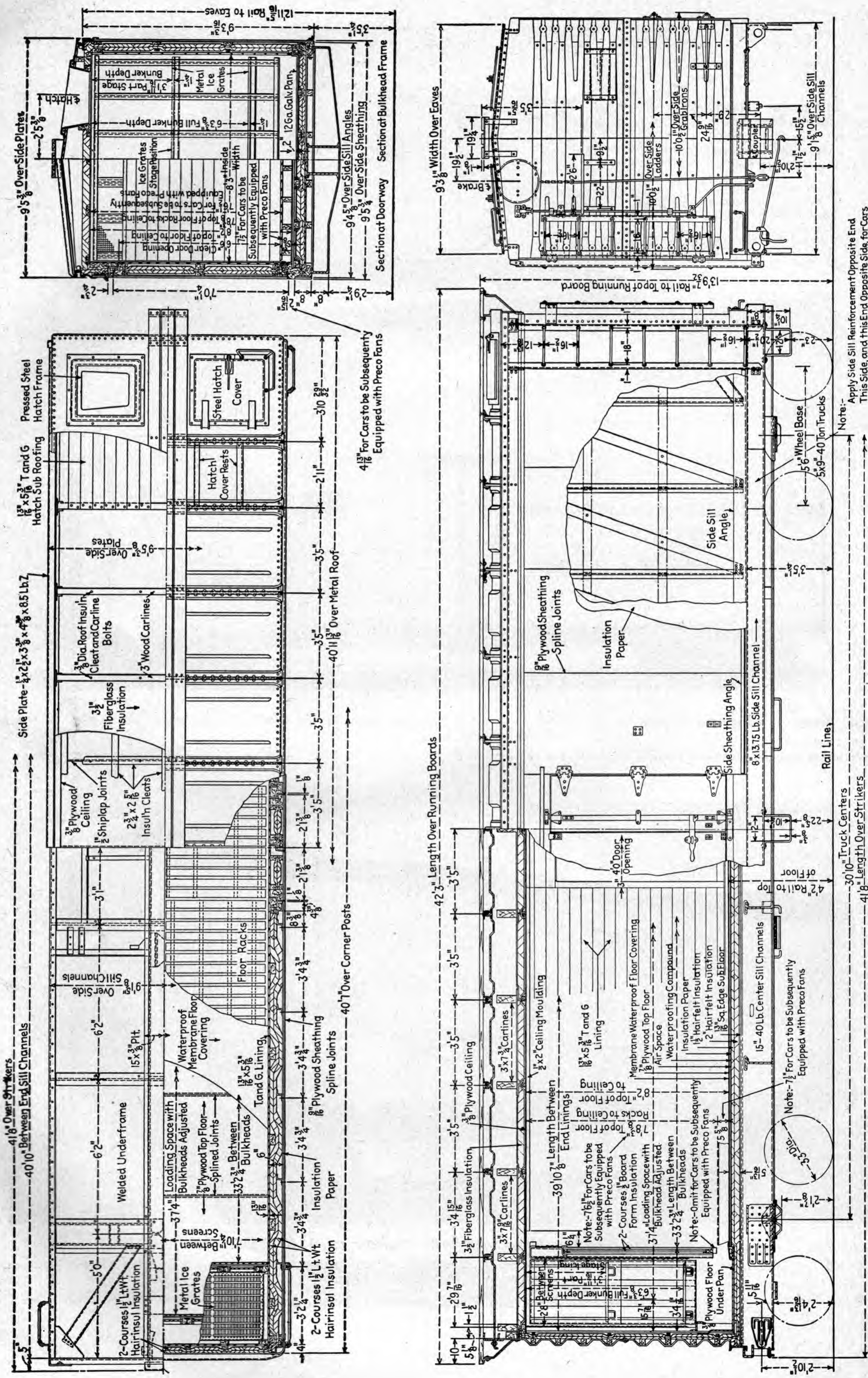
Inside length between bulkheads 33 ft. 3 in., bulkheads collapsed 39 ft. 0 in.; width 8 ft. 3 in.; height 7 ft. 3 in.; capacity 1,988 or 2,332 cu. ft.; light weight 56,600 lb.; load limit 79,400 lb.



Swift Refrigerator Line 40-ton fresh meat refrigerator car, A. A. R. Class RM.

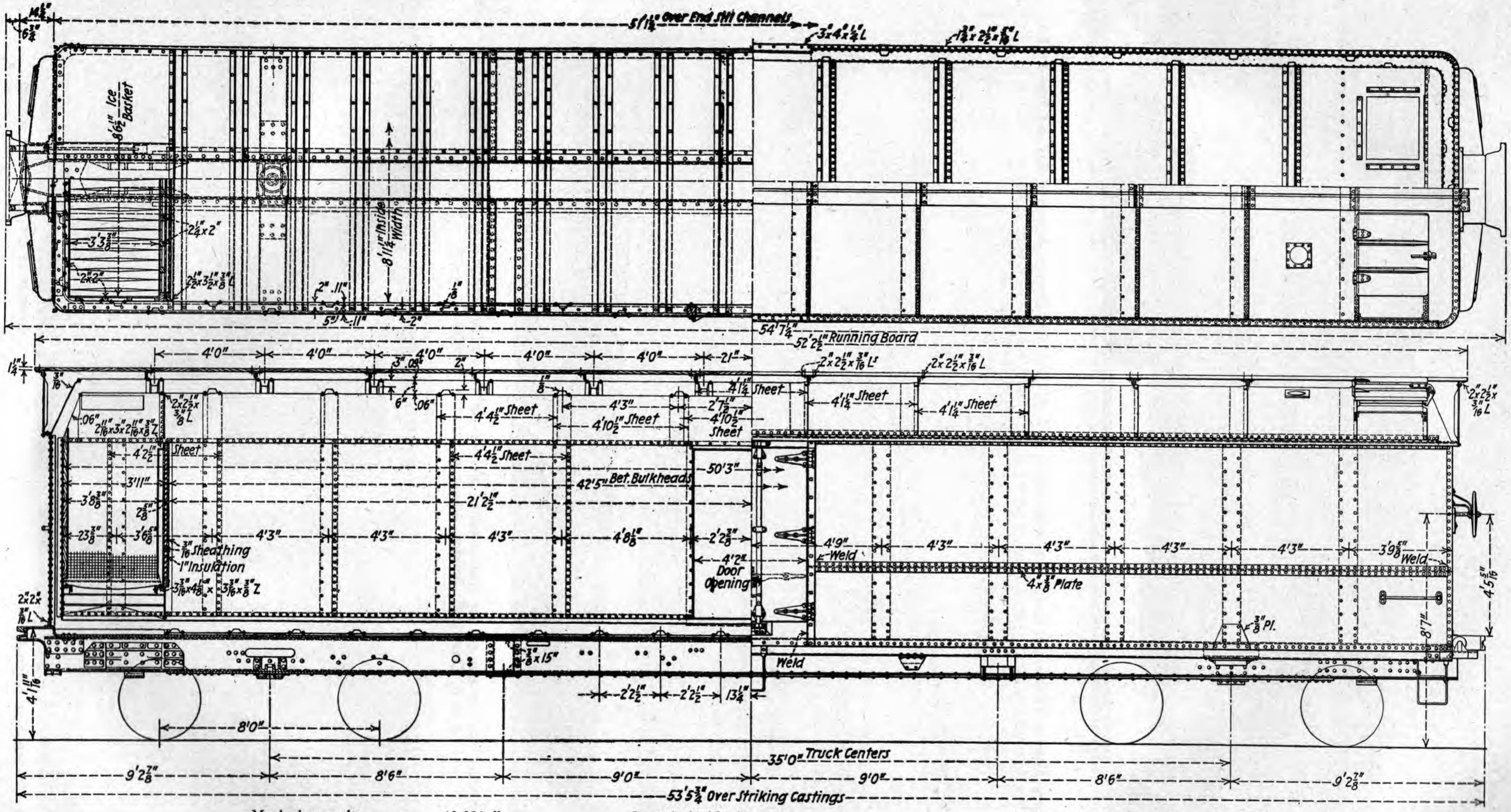
Weight 55,500 lb.; Load Limit 80,500 lb.; Inside Length between Bunkers 29 ft. 6 in.; Width 8 ft. 4 in.; Height 7 ft. 5 in.; Capacity 1,834 cu. ft.; Crushed Ice Capacity 6,400 lb.

General American Transportation Corporation



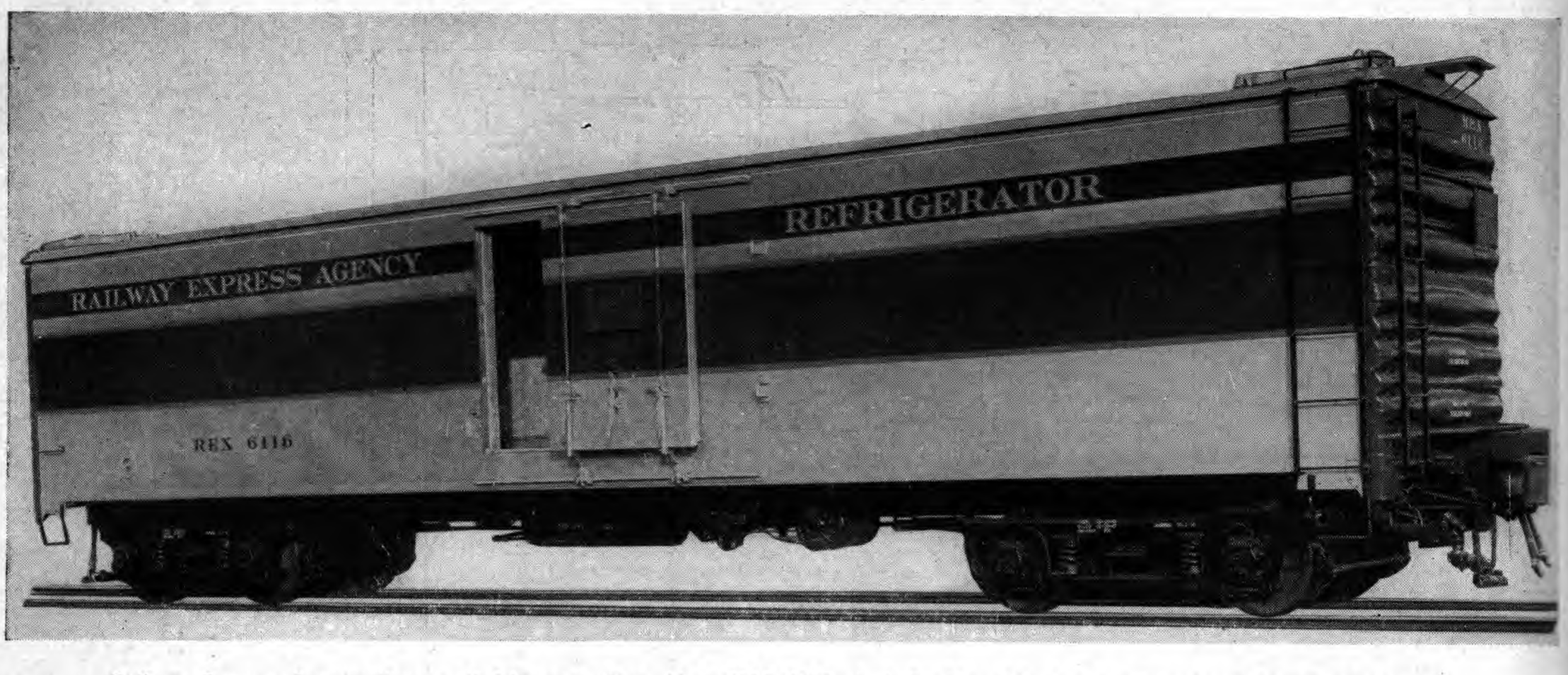
Fruit Growers Express 40-ft. refrigerator and ventilator car with adjustable end bunkers, stage icing and Preco circulating fans.

Plan, elevation and sections of Fruit Growers Express 40-ft. refrigerator and ventilator car with adjustable end bunkers, stage icing and Preco circulating fans.



Marked capacity .....40,000 lb.	Length inside between bulkheads collapsed...49 ft. 10 in.	Volume, bunkers in place with floor racks .....2,737 cu. ft.
Capacity, including ice....55,000 lb.	Width, inside.....8 ft. 11 in.	Capacity of ice bunkers..382 cu. ft.
Weight of car.....95,000 lb.	Height, inside.....7 ft. 8 in.	Capacity of ice bunkers, chunk ice, 14,325 lb.; crushed ice .....16,808 lb.
Length over end sills..51 ft. 1¼ in.	Volume, bunkers collapsed with floor racks .....3,024 cu. ft.	
Length inside between bulkheads .....42 ft. 2½ in.		

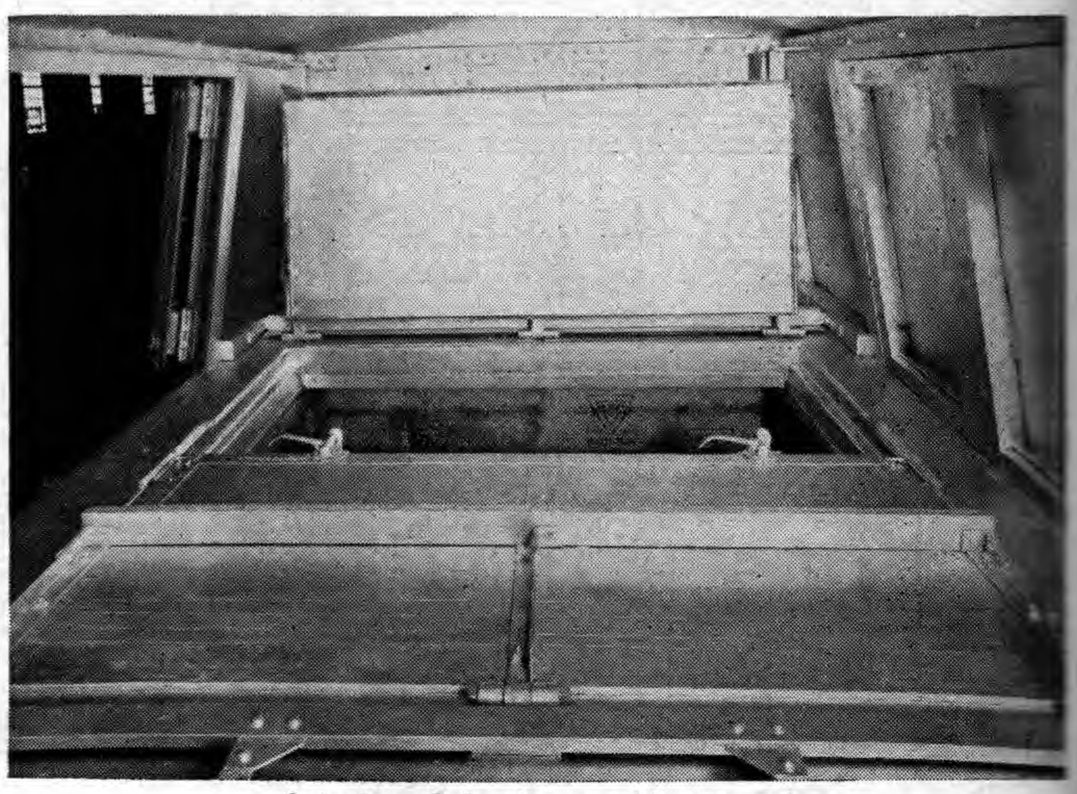
Plan and elevation of the Pennsylvania Railroad passenger-express refrigerator car, A. A. R. Class BR, Road Class R50b.



Railway Express Agency Express Refrigerator Cars, Nos. 6100-6599. A. A. R. Class BR. Builder, American Car and Foundry Co.
Capacity, 100,000 lb.; weight, 79,200 lb. (trucks 26,000 lb.); total length, inside 49 ft. 11¼ in.; between bulkheads 42 ft. 0¼ in.; width 8 ft. 2½ in.; cubic capacity between bulkheads, 2,286 cu. ft.; ice capacity, 12,900 lb.

Heavily insulated refrigerator car for transportation of solid carbon dioxide (dry ice) in container bins, A. A. R. Class LRC. Builder, American Car and Foundry Company.

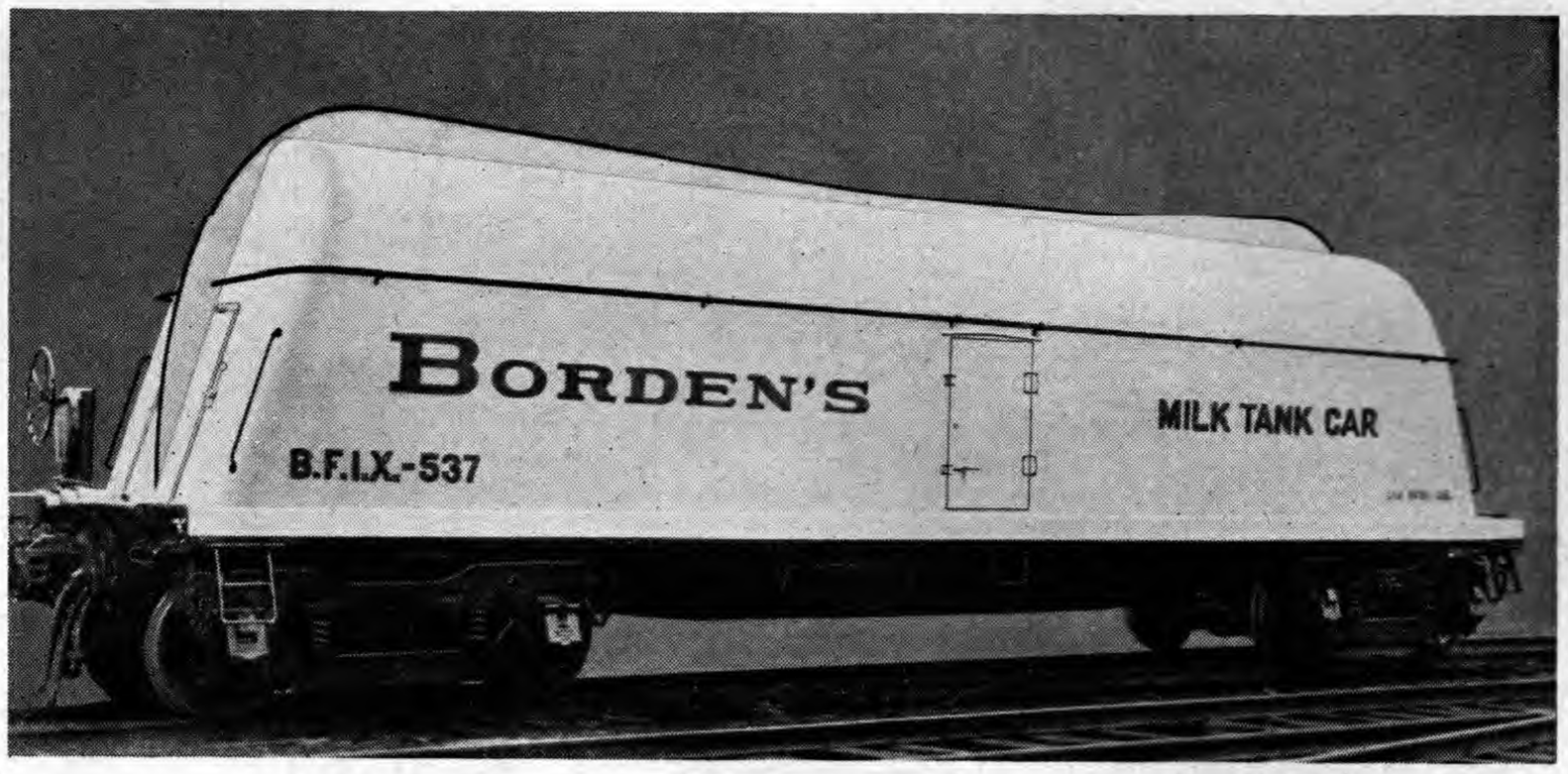
Interior of dry ice car-bins covered.

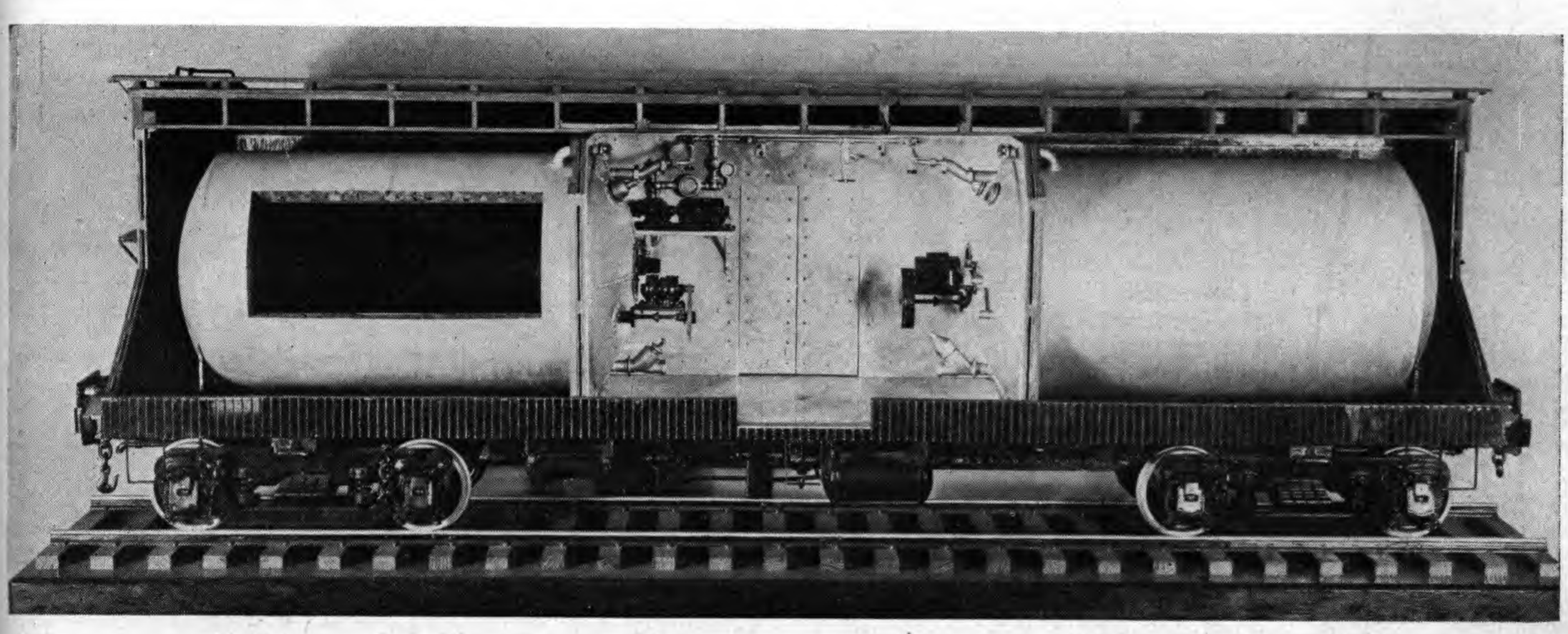


Interior of dry ice car-bin opened.

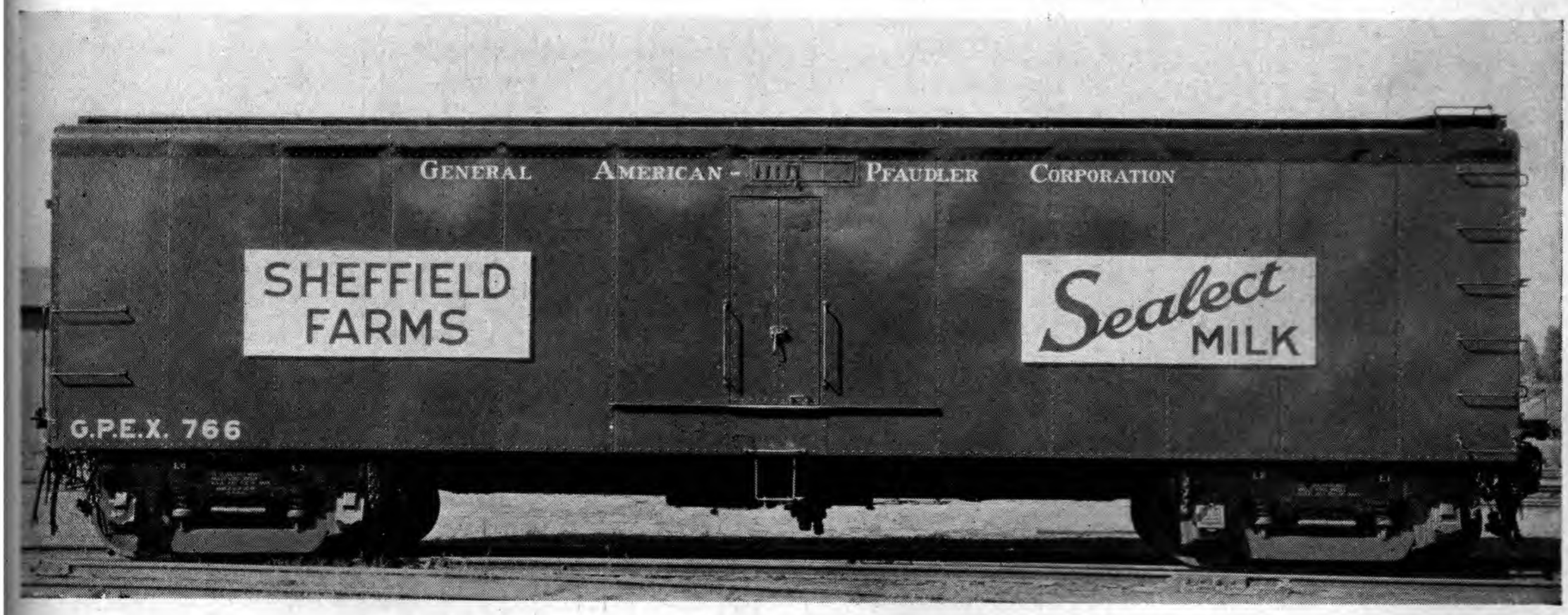
Streamlined glass-lined milk tank car. Borden Farm Products Company, Inc.

Glass Lined Tanks 2
Capacity .....12,000 gal.
Light weight .....84,000 lb.

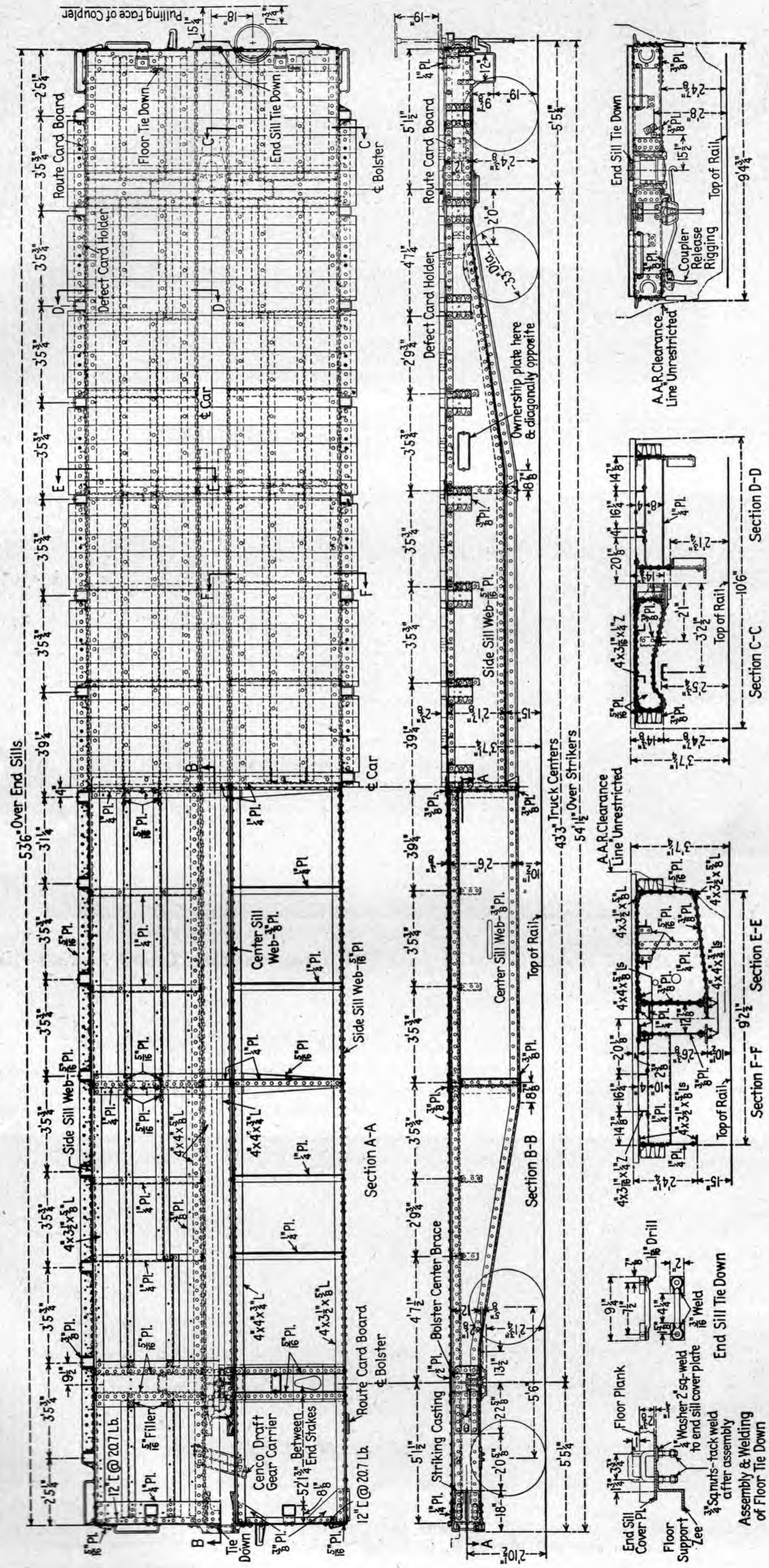




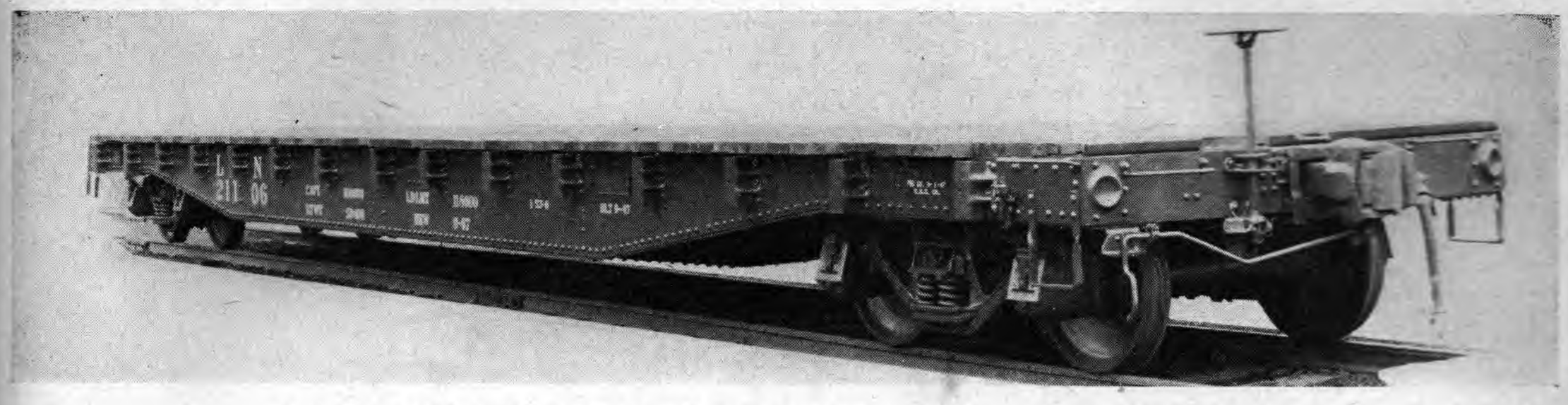
Glass-lined milk tank express car. Sides removed to show location of tanks, fittings and compressor. General American-Pfaudler Corporation.



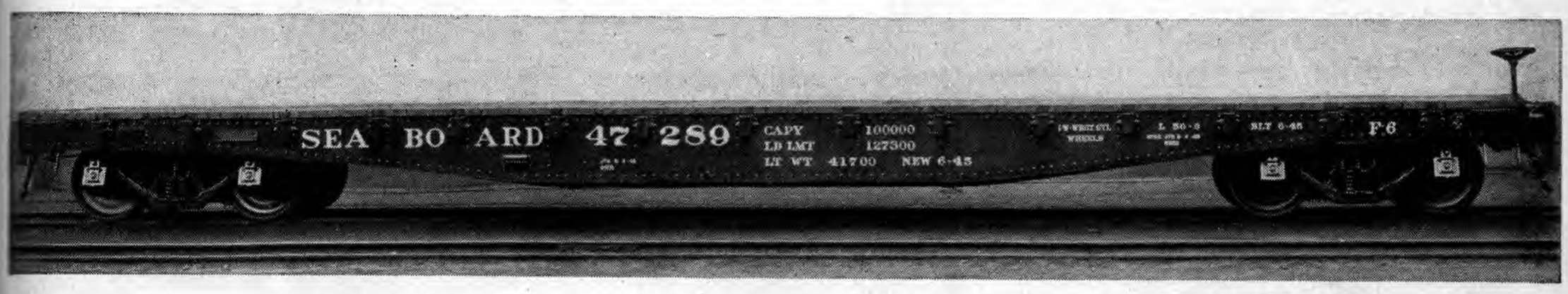
General American-Pfaudler Corporation milk car with two glass-lined tanks, each of 3,000 gal. capacity. Length over end sills 40 ft. 6 in., light weight 74,800 lb.



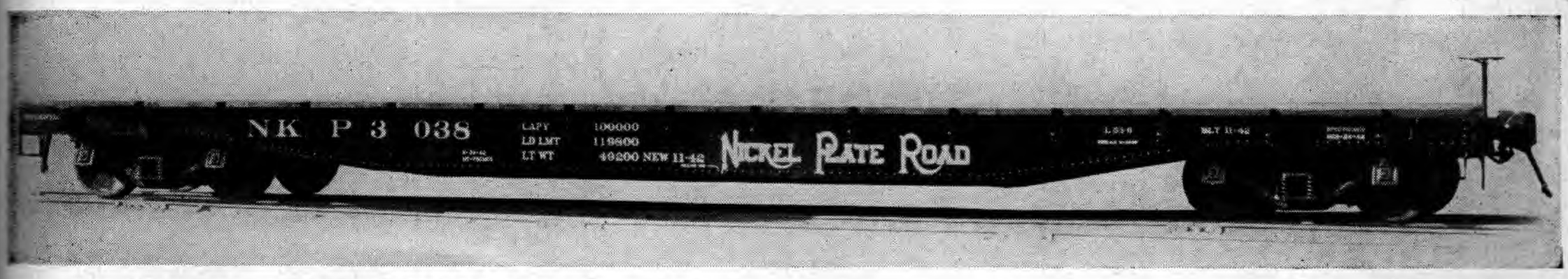
Sectional plan, elevation and cross-sections showing details of Louisville & Nashville 50-ton, 53 ft. 6 in., all-welded steel flat car with special tie-downs at either end. Series 21,100-21,399.
Builder, Greenville Steel Car Company.



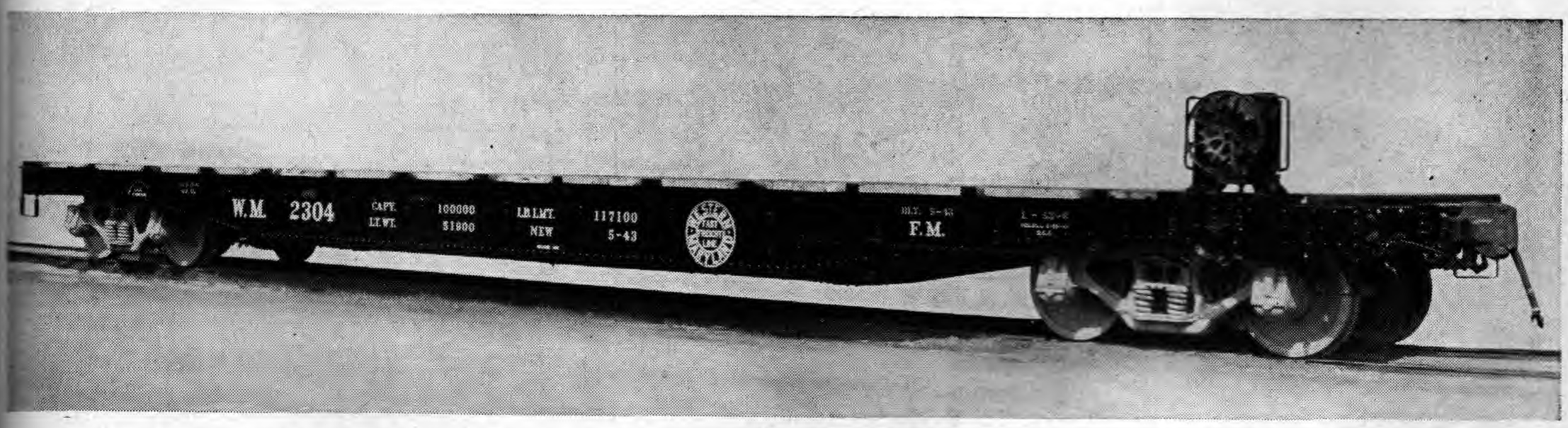
Louisville and Nashville 50-ton, 53 ft. 6 in., steel flat car. Builder, Greenville Steel Car Co.
Length over end sills, 53 ft. 6 in.; width, 10 ft. 6 in.; light weight 50,400 lb.; load limit, 118,600 lb.



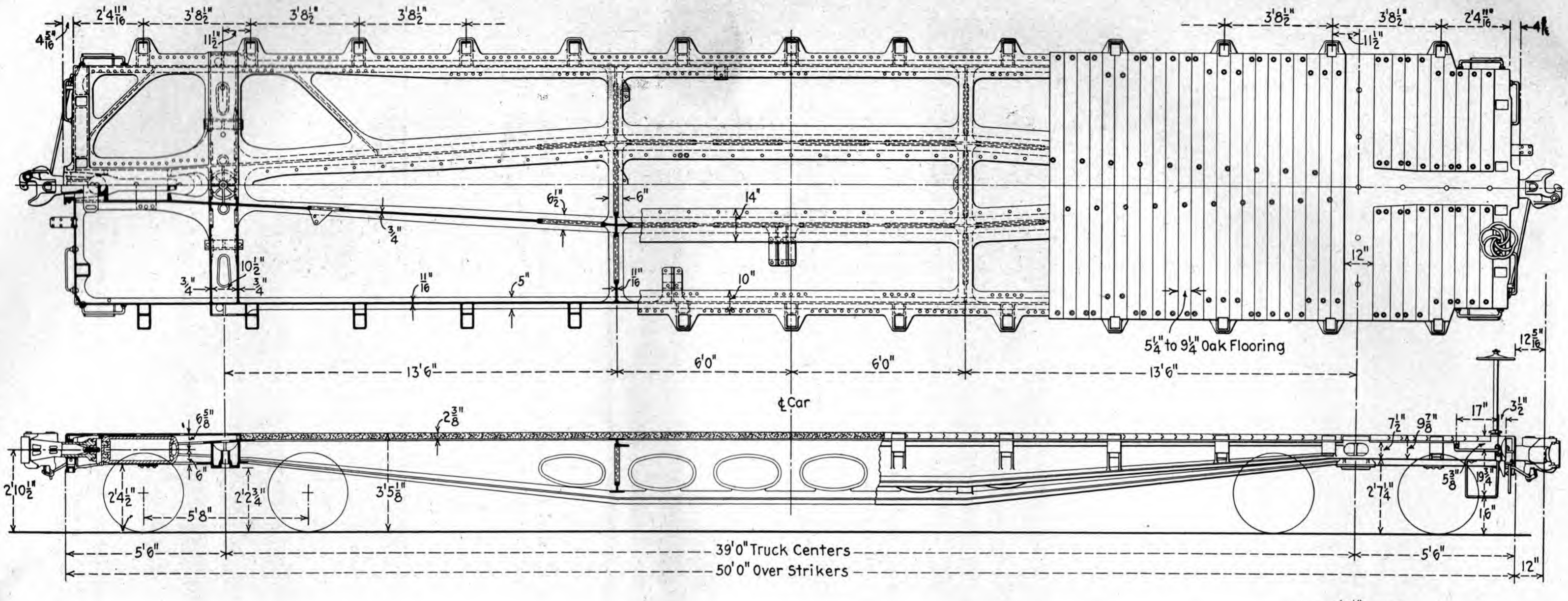
Seaboard Air Line 50-ton, 50-ft., steel flat car. Road Class F6. Builder, Bethlehem Steel Co.
Length of platform 50 ft.; width 9 ft. 4 in.; light weight, 41,700 lb.; load limit, 127,300 lb.

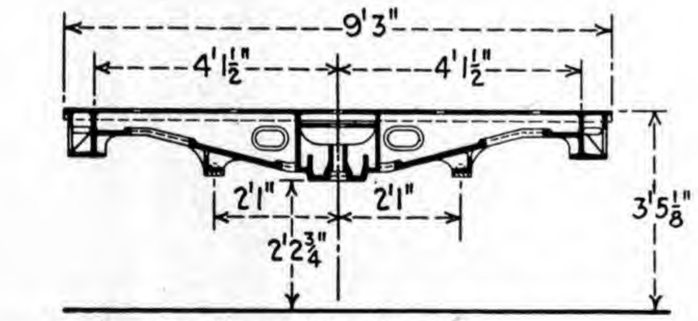


New York, Chicago & St. Louis (Nickel Plate) 50-ton, 53 ft. 6 in., steel flat car. Builder, Pullman-Standard Car Manufacturing Co.
Length over end sills, 53 ft. 6 in.; width of platform, 10 ft. 6 in.; height to platform, 3 ft. 9 in.; light weight, 49,200 lb.; load limit, 119,800 lb.

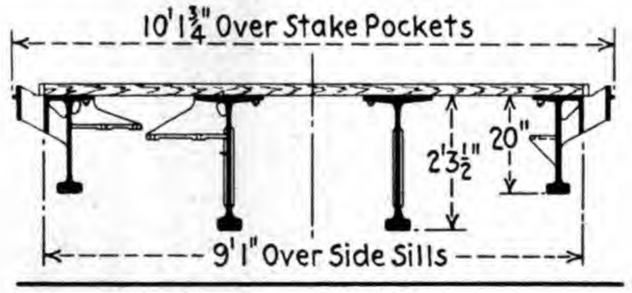


Western Maryland 50-ton, 53 ft. 6 in., steel flat car. Builder, American Car and Foundry Co.
Length over end sills, 53 ft. 6 in.; width of platform, 10 ft. 6 in.; height to platform. 3 ft. 7¼ in.; light weight, 51,900 lb.; load limit, 117.100 lb.
Description: *Railway Age* July 3, 1943

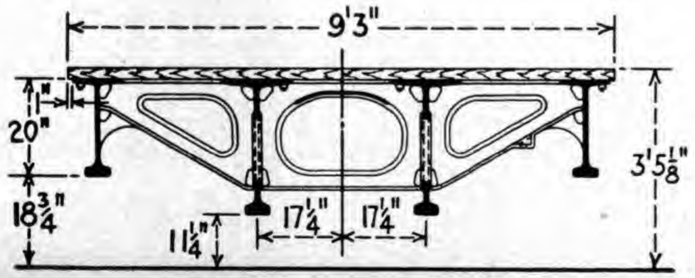




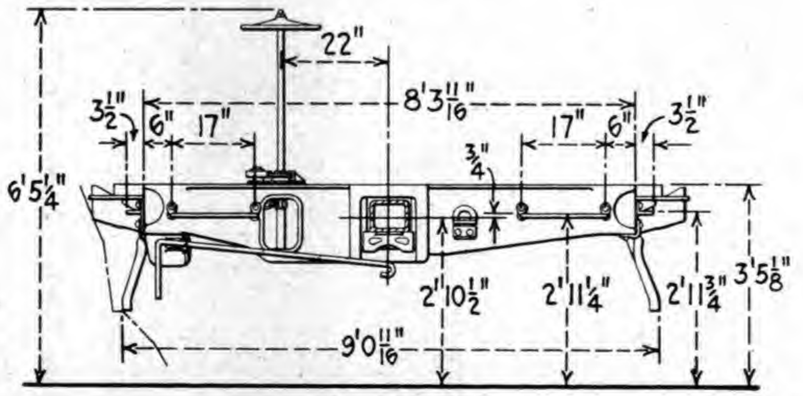
Section at ℄ of Bolster



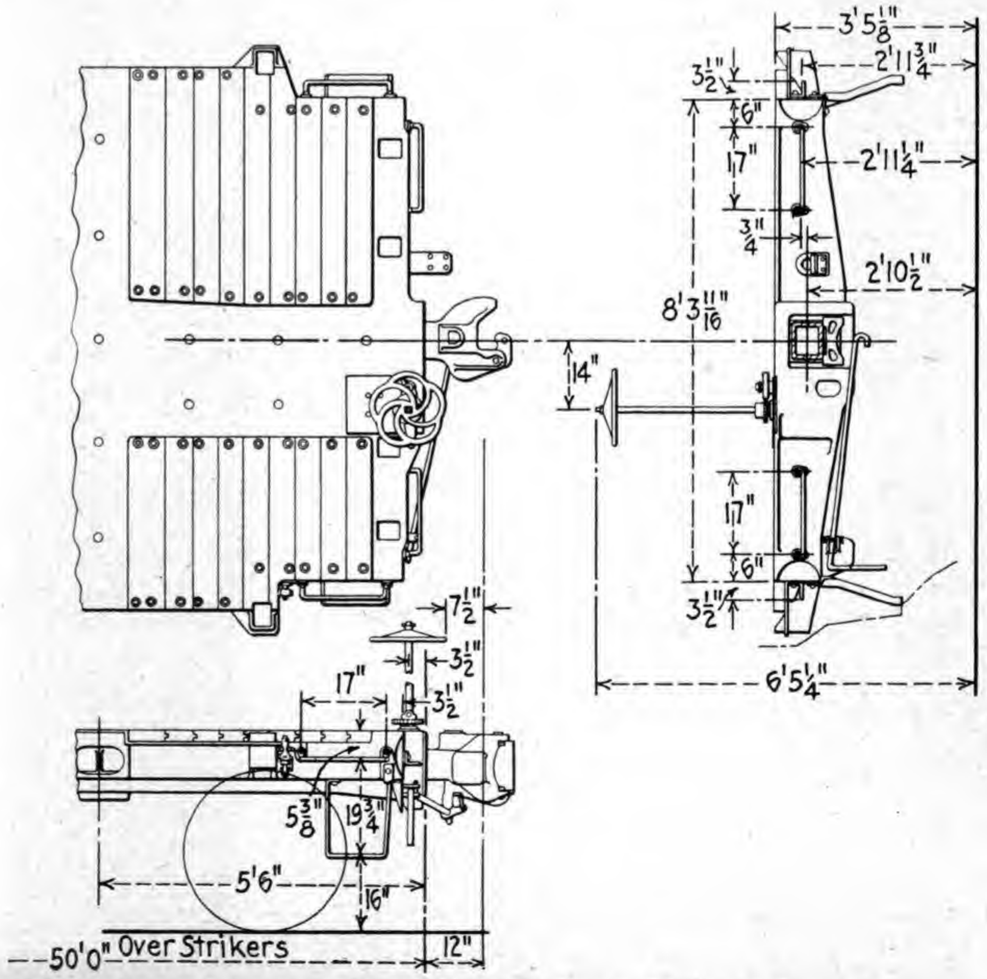
Section at ℄ of Car



Section at Crossbearer



End View

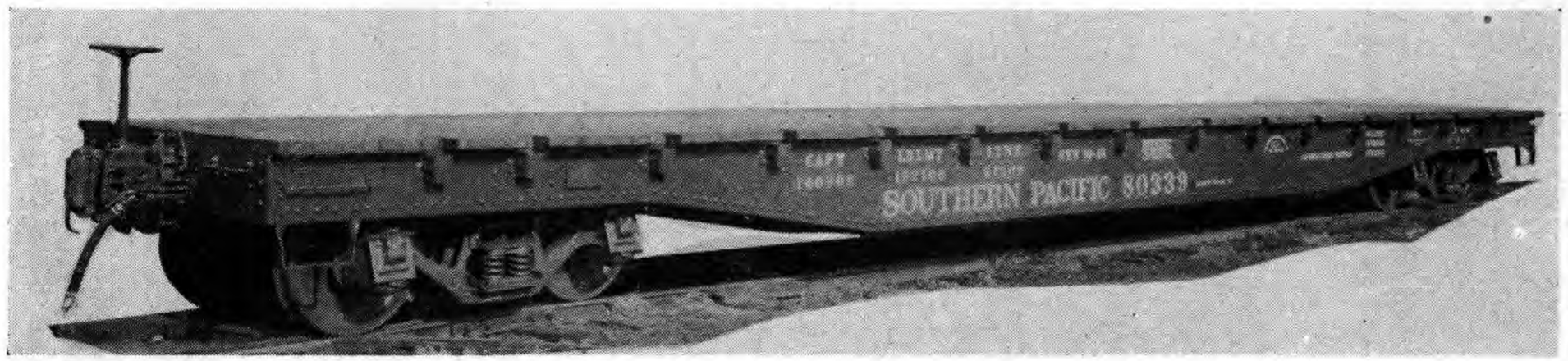


General arrangement of Pennsylvania Railroad, Class F30A, 70-ton flat car with cast-steel underframe. Length over strikers 50 ft. Built at Altoona shops.
Design recommended by A.A.R. Committee on Car Construction, October, 1941 —Underframe furnished by General Steel Castings Corp.

Pennsylvania Railroad 70-ton, 50 ft., steel flat car with cast steel underframe and wood floor. Road Class F-30A. Built at Altoona shops.

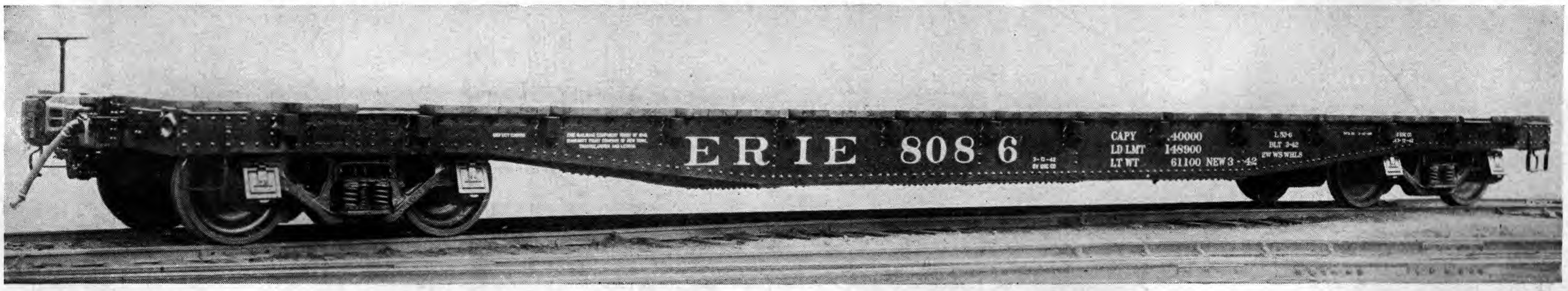
Design recommended by A.A.R. Committee on Car Construction, October 1941

Length over strikers 50 ft.; width of platform 9 ft. 3 in.; height to top of floor 3 ft. 5⅛ in.; light weight, 52,900 lb.; load limit, 157,100 lb.



Southern Pacific 70-ton, 53 ft. 6 in. steel flat car. Builder, American Car and Foundry Co.

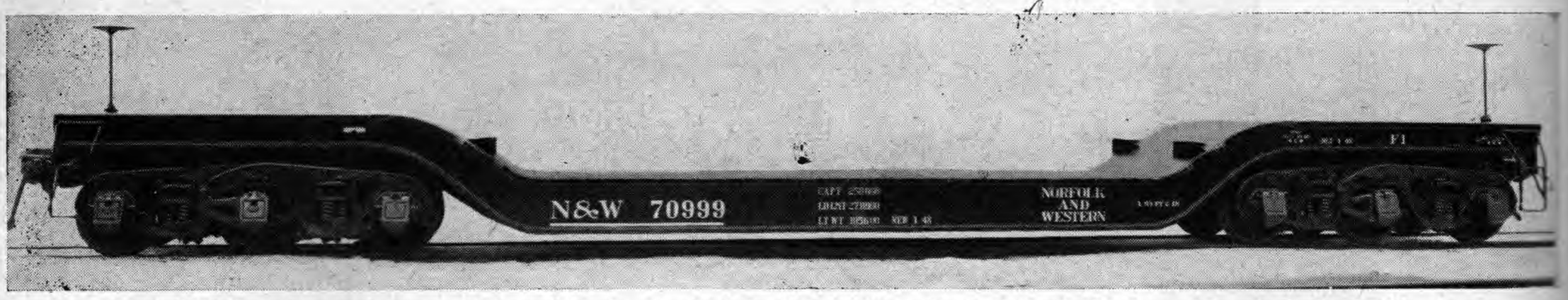
Length over end sills 53 ft. 6 in.; width 9 f. 4 in.; height to top of floor 3 ft. 9⅞ in.; light weight 57,300 lb.; load limit 152,700 lb



Erie Railroad 70-ton, 53 ft. 6 in., steel flat car with wood floor. Builder, Greenville Steel Car Co.

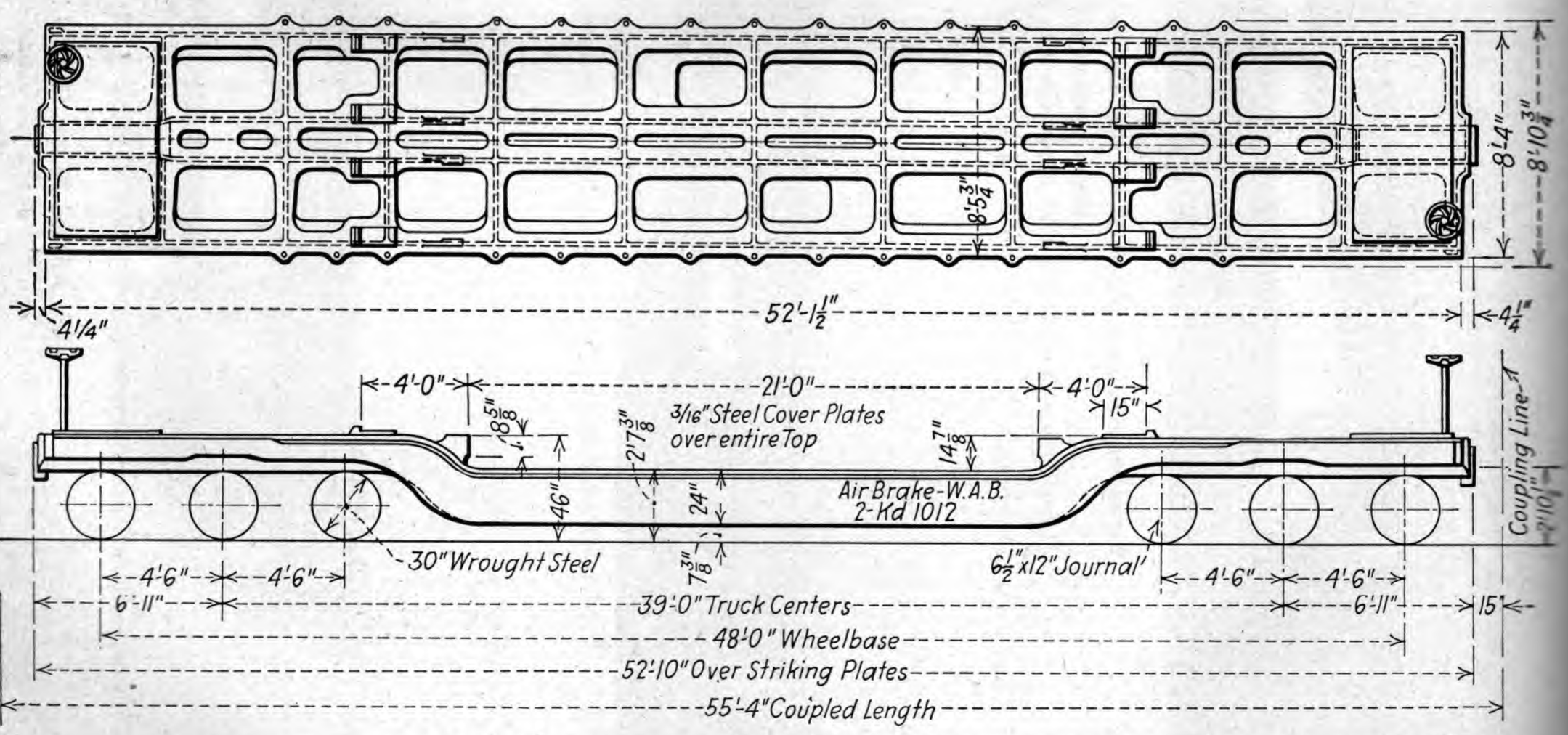
Design recommended by A.A.R. Committee on Car Construction, October 1941

Length of platform 53 ft. 6 in.; width 10 ft. 4 in.; height to top of floor 3 ft. 5 in.; light weight, 61,000 lb.; load limit 148,900 lb.



Norfolk & Western depressed center 125-ton flat car, Road Class F-1. Builder, General Steel Castings Corp. and N. & W. shops.
Length over end sills, 53 ft. 2 in.; width of platform, 8 ft. 4 in.; height to platform, 2 ft. 6 in.; light weight, 105,600 lb.; load limit, 270,900 lb.

Depressed-center erection car built for American Bridge Co. by Greenville Steel Car Co.
Length over end sills 55 ft. 7 in.; light weight 80,000 lb.; lugs at left for anchoring a derrick



Reading and Erie depressed-center flat car, 275,000 lb. capacity, weight 104,200 lb. with Commonwealth one-piece cast steel under frame and Commonwealth 6-wheel equalized trucks.

General Steel Castings Corporation.

Above—Chicago, Milwaukee, St. Paul & Pacific 195,000 lb. capacity well-hole flat car, low alloy steel, welded construction. Built at Milwaukee shops. A. A. R. Class FW.

Length over strikers 48 ft. 4 in.; length of well 25 ft. 2 in.; width of well 7 ft. 9¼ in.; depth of well 3 ft. 10¾ in.; height to floor, center, 1 ft. 7½ in.; light weight, 55,900 lb.; load limit, 195,100 lb.

New York Central 97½-ton cast steel well-hole flat car, lot 704-F.

Length 39 ft. 3 in.; width 9 ft. 11 in.; well 16 ft. 10 in. long, 7 ft. 6 in. wide; light weight, 55,200 lb.; load limit, 195,800 lb.

Chesapeake & Ohio 125-ton well-hole flat car, welded construction. Builder, Greenville Steel Car Co.

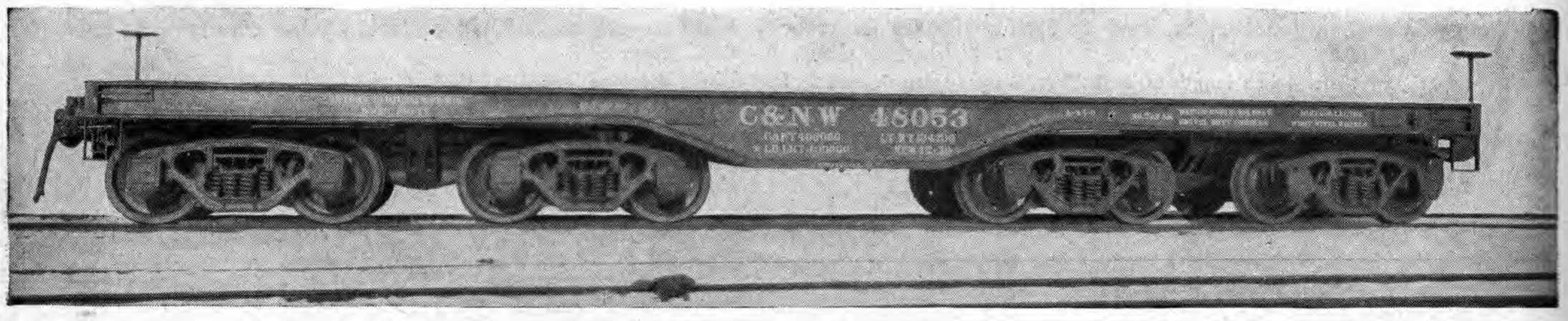
Well 35 ft. 0 in. long; 7 ft. 8 in. wide; 2 ft. 4¾ in. deep

The Pennsylvania Railroad 125-ton steel underframe well-hole flat car of all-welded construction. Road Class F33, A. A. R. Class FW.

Length over end sills 51 ft. 6¾ in.; height to top 4 ft. 3⅝ in.; length of well 25 ft. 2 in.; width of well 7 ft. 8 in.; depth of well 2 ft. 4¾ in.; light weight, 97,600 lb.; load limit, 250,000 lb.

Chicago, Milwaukee, St. Paul & Pacific 100-ton flat car. Built at Milwaukee shops.

Length 30 ft. 0 in.; width 10 ft. 2 in.; height to top of floor 3 ft. 9 in.; light weight 46,700 lb.; load limit 204,300 lb.



Chicago & North Western 200-ton flat car. Commonwealth one-piece cast steel underframe. Dual four-wheel trucks. A. A. R. Class FG.

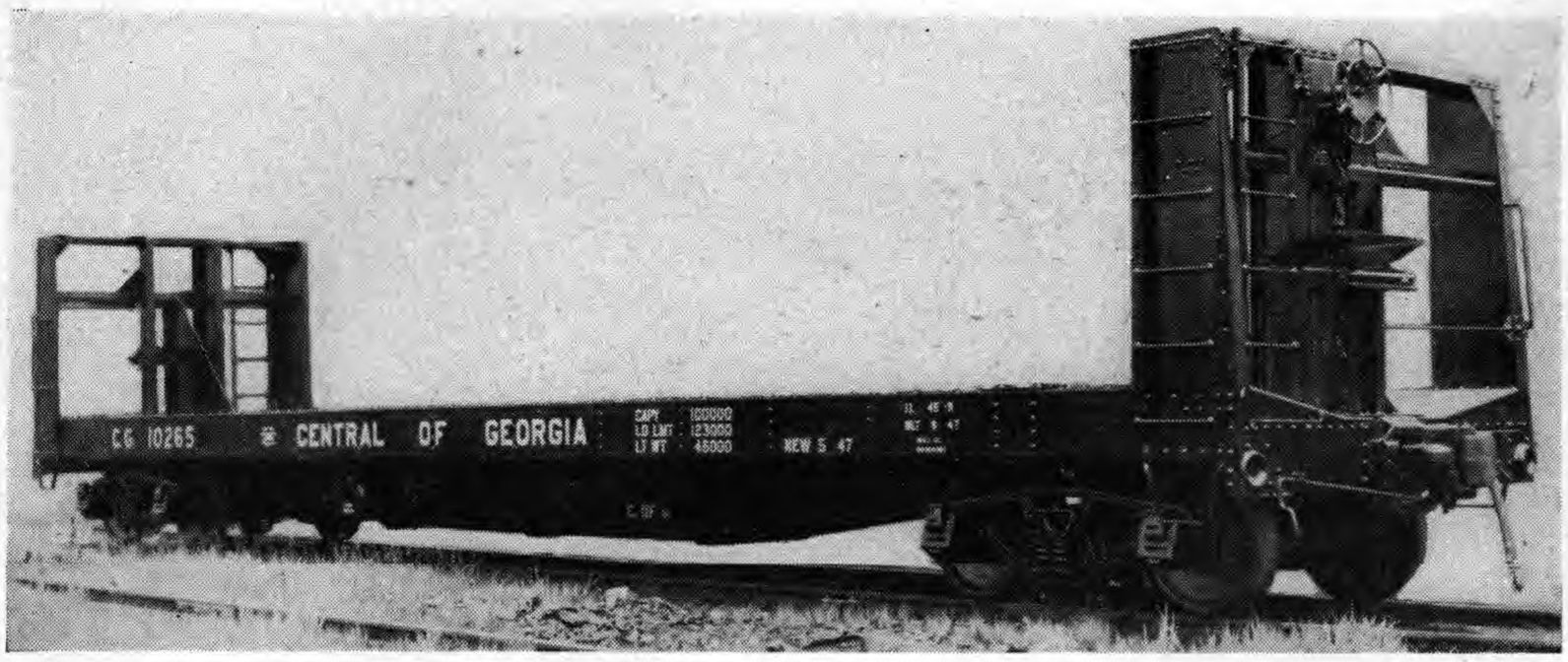
Length 44 ft.; height to floor 4 ft. 2 in.; light weight, 104,700 lb.; load limit, 397,300 lb.

New York Central 198-ton special steel flat car. Builder, Despatch Shops, Inc.

Length of platform 46 ft. 3 in.; width 10 ft. 0 in.; height to top of floor 3 ft. 11 in.; light weight 105,600 lb.; load limit 396,400 lb.

Chesapeake & Ohio 125-ton, 56-ft., flat car. Builder, Greenville Steel Car Co.

Length over end sills 56 ft. 0 in.; width of platform 10 ft. 2½ in.; height to platform 4 ft. 3⅝ in.; light weight, 100,900 lb.; load limit, 275,600 lb.

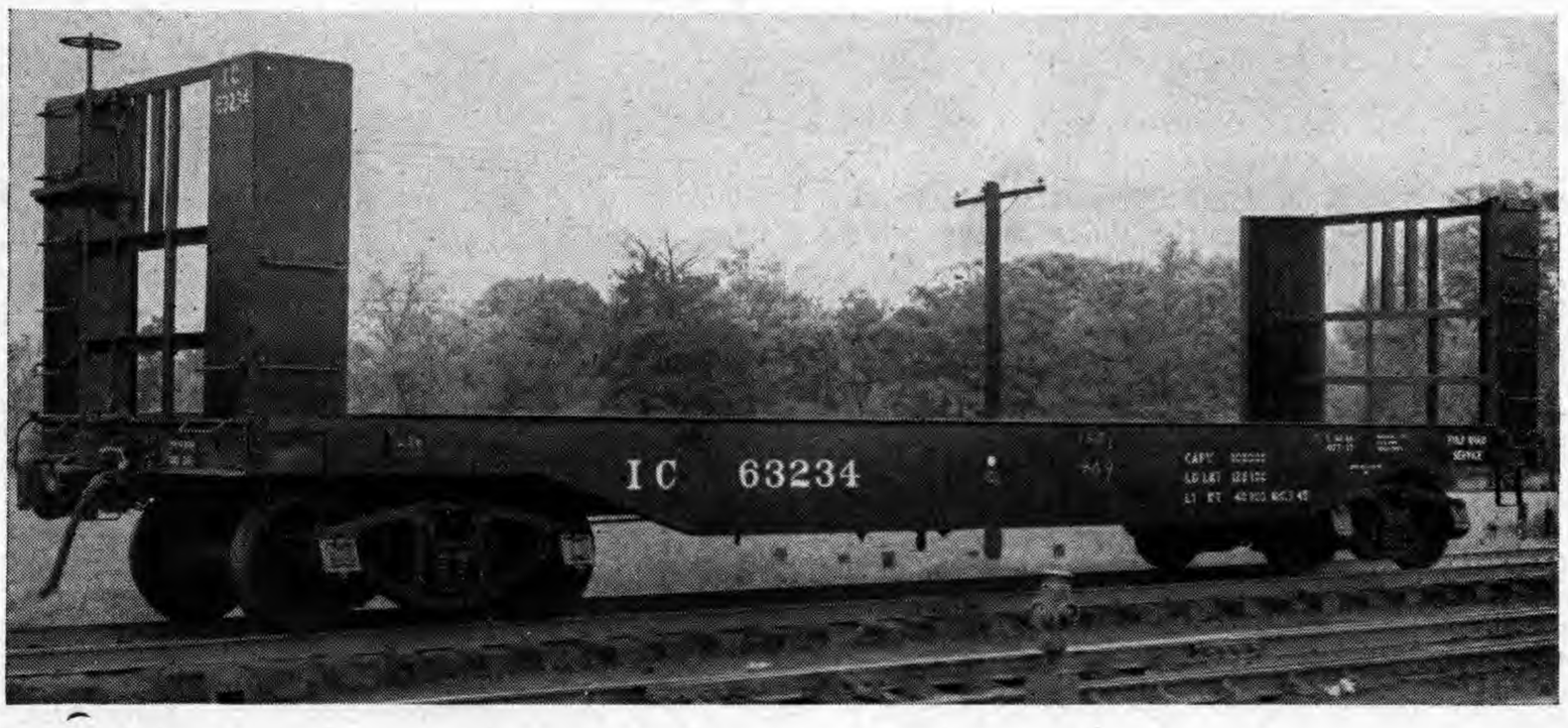


Central of Georgia pulpwood rack car, A. A. R. Class LP. Series 10,265-10,464. Builder, Pressed Steel Car Co., Inc.

Inside, length, 45 ft. 9 in.; width, 9 ft. 2½ in.; height of ends, 6 ft. 0 in.; light weight, 46,000 lb.; load limit, 123,000 lb.

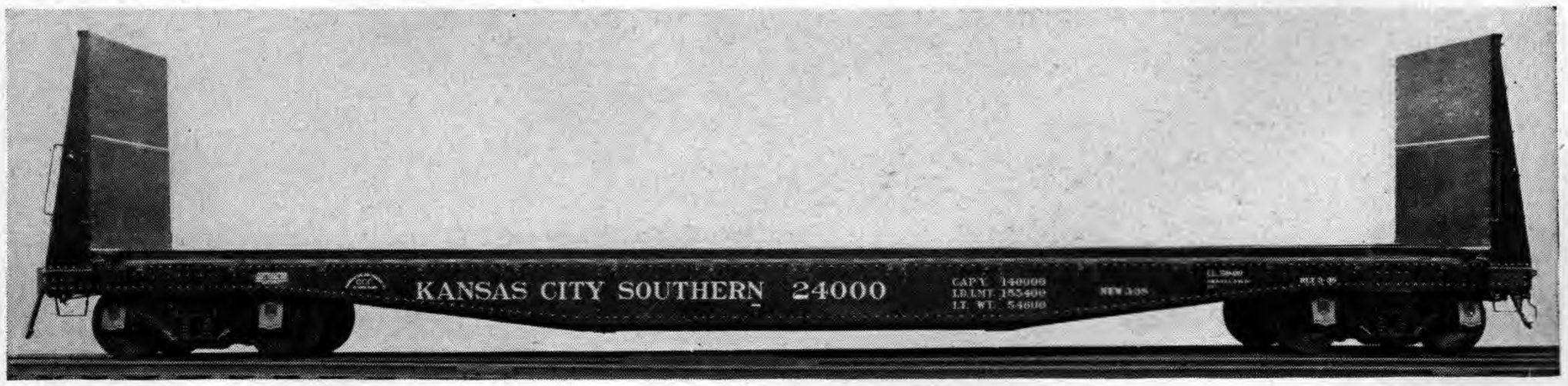
Missouri Pacific pulpwood rack car, A. A. R. Class LP. Series 1500-1649. Built at Missouri Pacific shops.

Inside length, 41 ft. 3 in.; width, 9 ft. 1 in.; height of ends, 9 ft. 1 in.; light weight, 44,600 lb.; load limit, 124,400 lb.; capacity, 21 cords. Description: *Railway Mechanical Engineer,* May 1942.

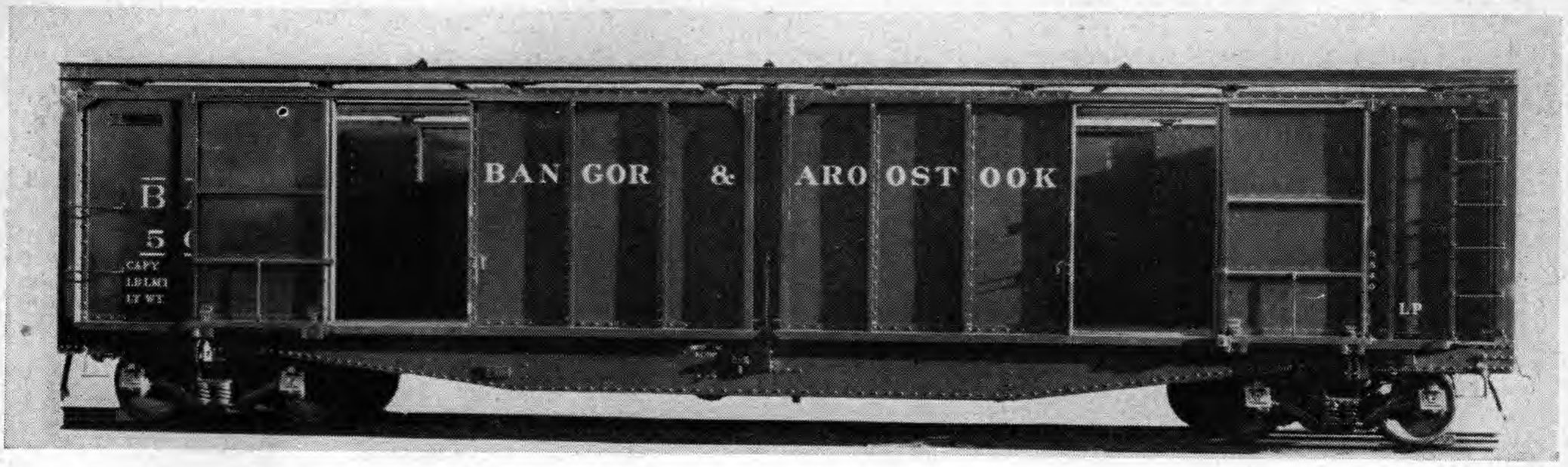


Illinois Central pulpwood rack car, A. A. R. Class LP. Series 63,000-63,299. Rebuilt from old gondola cars at Illinois Central shops.

Inside length, 40 ft. 4½ in.; height of ends, 6 ft. 6 in.; light weight, 40,900 lb.; load limit, 128,100 lb.



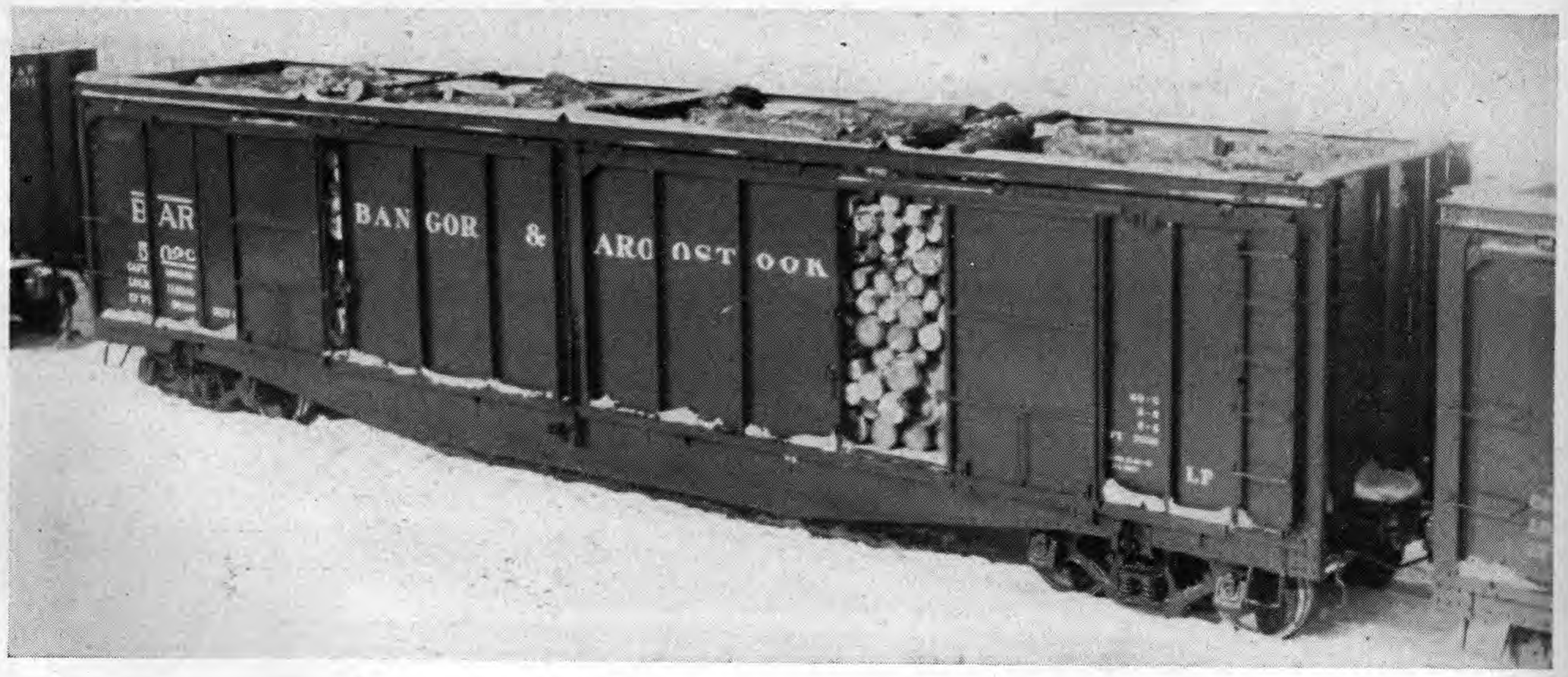
Kansas City Southern pulpwood rack car, A. A. R. Class LP. Builder, American Car and Foundry Company.
Length, inside 50 ft.; light weight, 54,600 lb.; load limit, 155,400 lb.



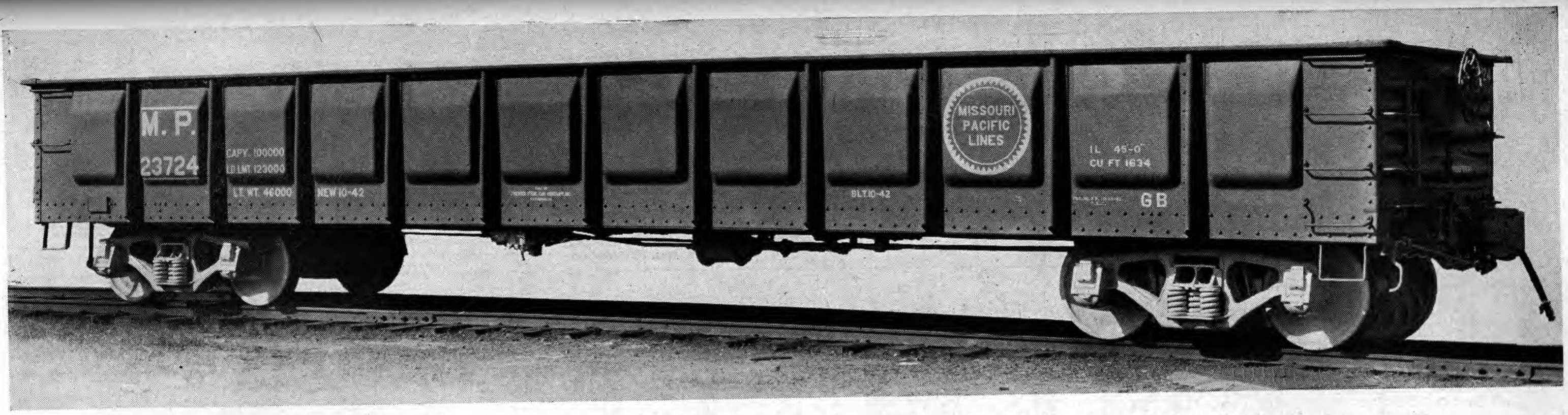
Bangor & Aroostook pulpwood rack car, A. A. R. Class LP with side door openings. Builder, Magor Car Corp.

Inside length 46 ft.; width 8 ft. 5 in.; height 8 ft. 4 in.; light weight, 56,200 lb.; load limit, 112,800 lb.

The car is unloaded by a car-dumping device. Hydraulic cylinders actuate the car locking mechanism and tip the car to dump the pulpwood into the sluice as the car sides swing open.

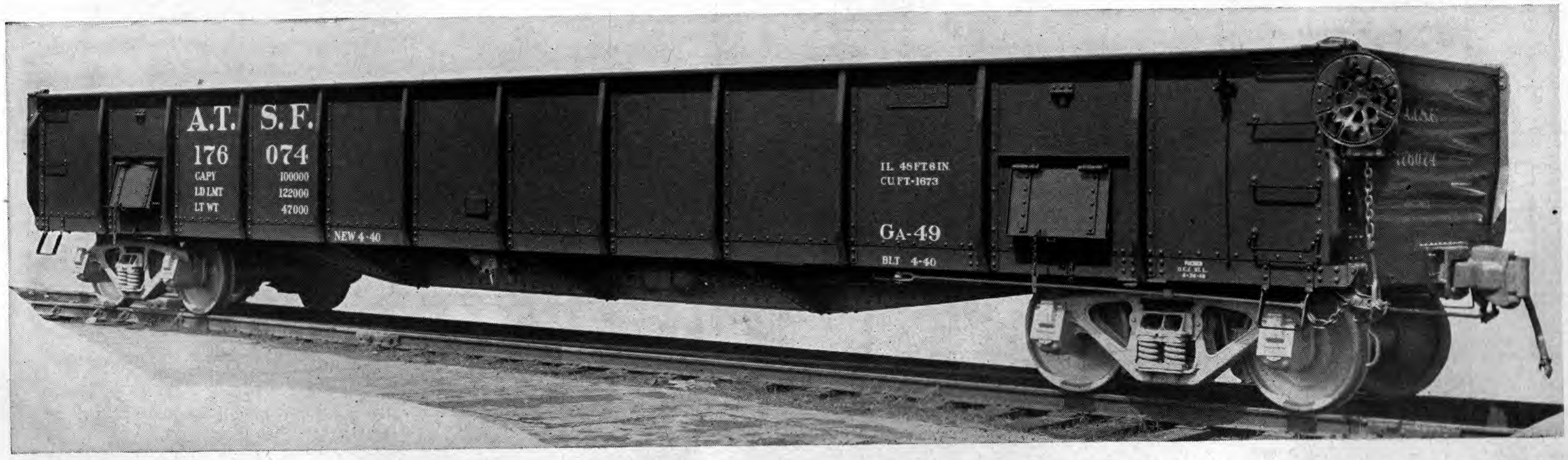


The pulpwood rack car has an open top and side doors for manual unloading operations.



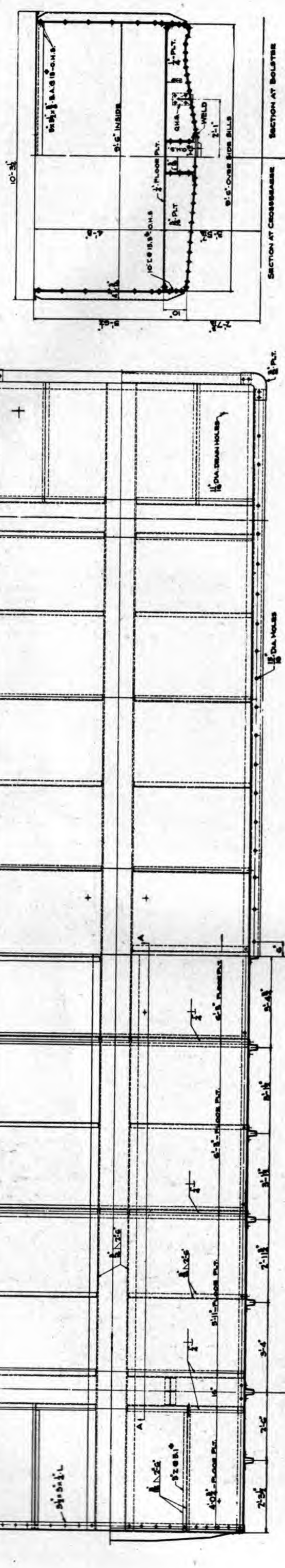
Missouri Pacific 50-ton, 45 ft. 0 in., gondola car with fixed ends, solid bottom and panel sides. Builder, Pressed Steel Car Co., Inc.

Inside, length 45 ft. 0 in.; width 9 ft. 5 in.; height of sides, 3 ft. 9 in.; capacity, 1,634 cu. ft.; light weight, 46,000 lb.; load limit, 123,000 lb.



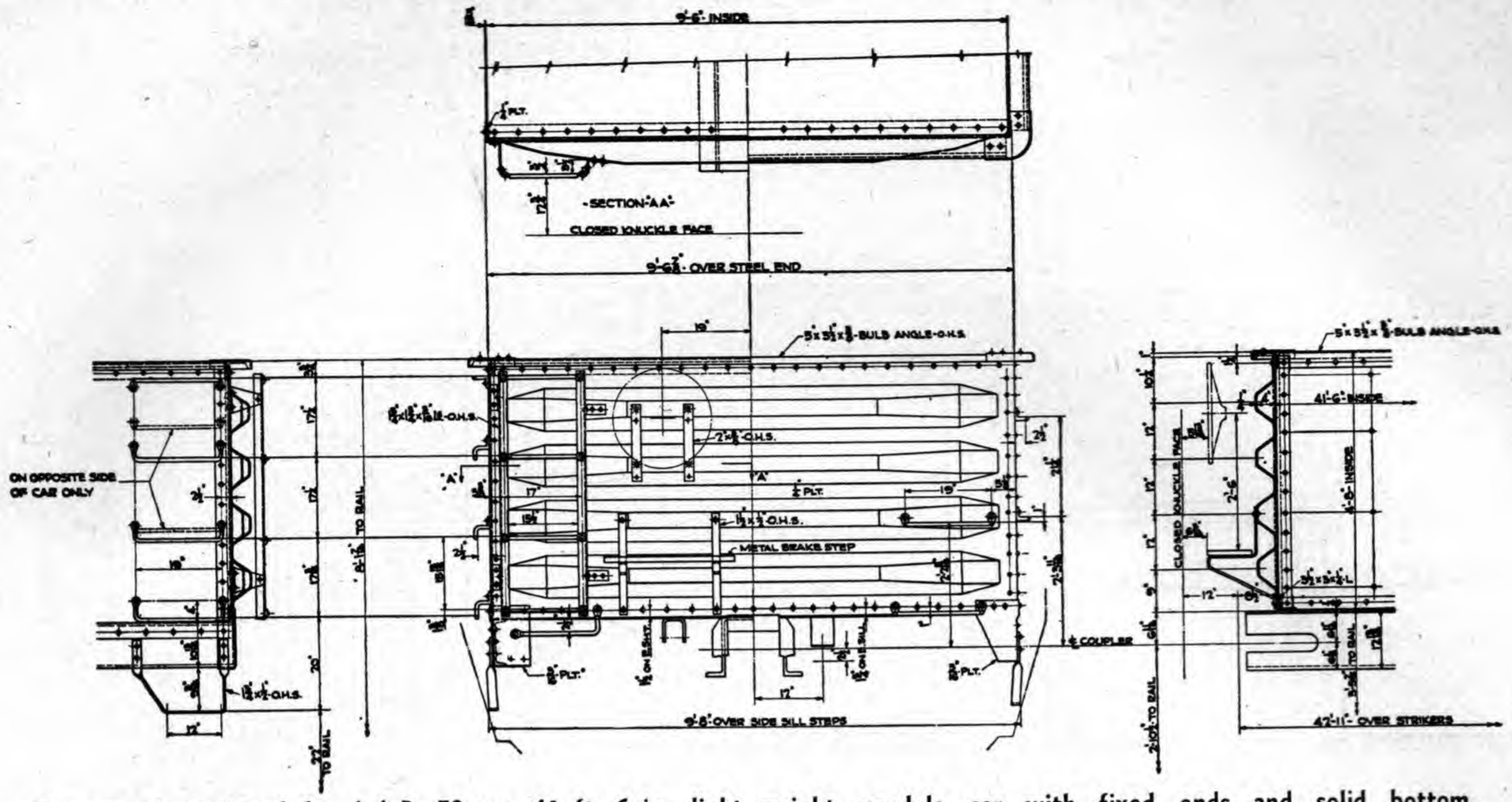
Atchison, Topeka & Santa Fe 50-ton, 48 ft. 6 in., all-steel gondola car with drop-ends, wooden floor and small side doors for manual shovel unloading of bulk coal at wayside stations. Road Class GA-49. Builder, American Car and Foundry Company.

Inside, length 48 ft. 6 in.; width 9 ft. 0 in.; height of sides 3 ft. 10 in.; capacity 1,673 cu. ft.; light weight 47,000 lb.; load limit 122,000 lb.

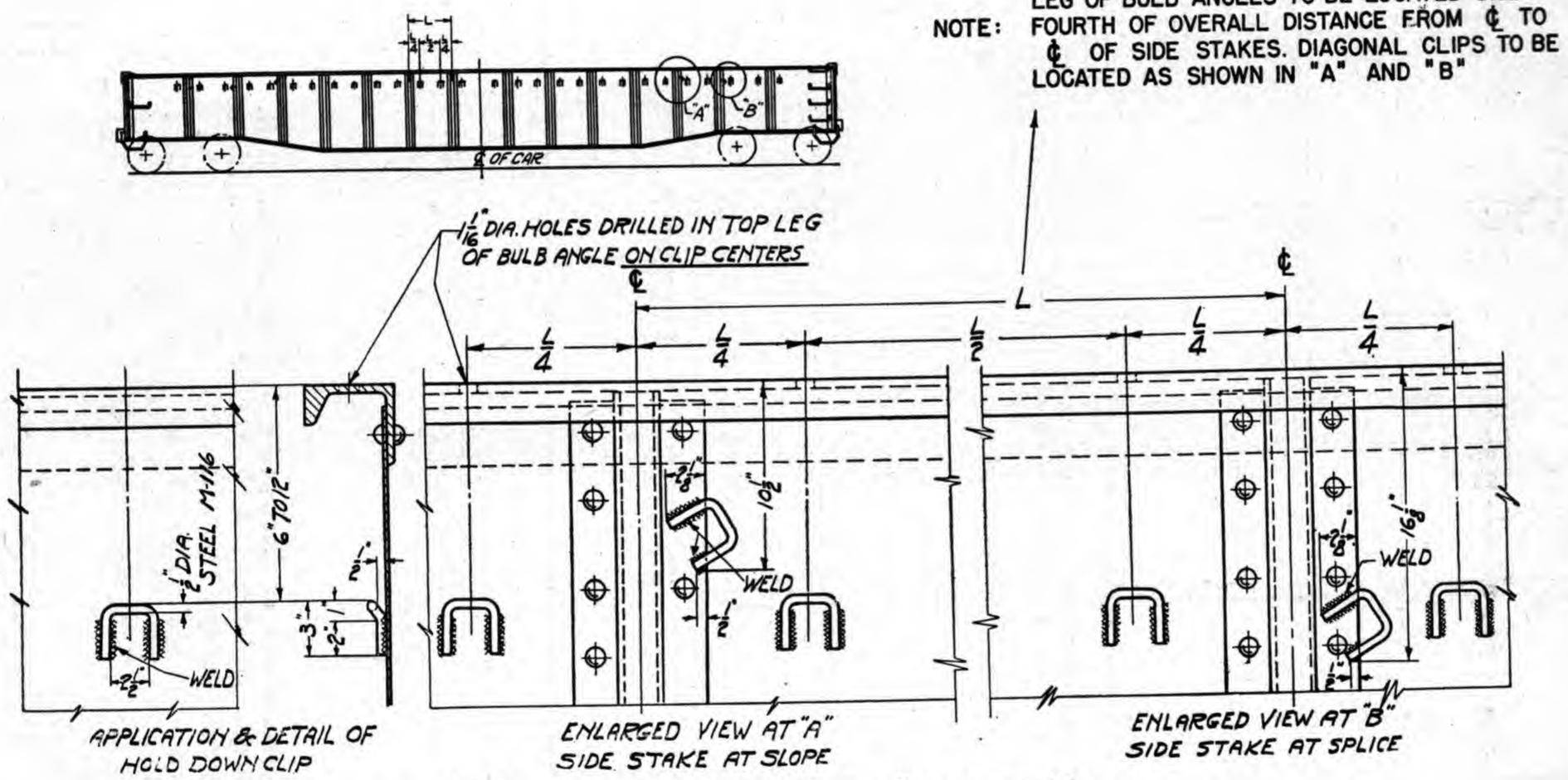


Plan, elevation and sections of A.A.R. 50-ton, 41 ft. 6 in., light-weight, high side gondola car with fixed ends and solid bottom.

Inside, length, 41 ft. 6 in.; width, 9 ft. 6 in.; height of sides, 4 ft. 8 in.; capacity, 1840 cu. ft.
A. A. R. Supplement to Manual, Plate 800.
(*See also opposite page*)

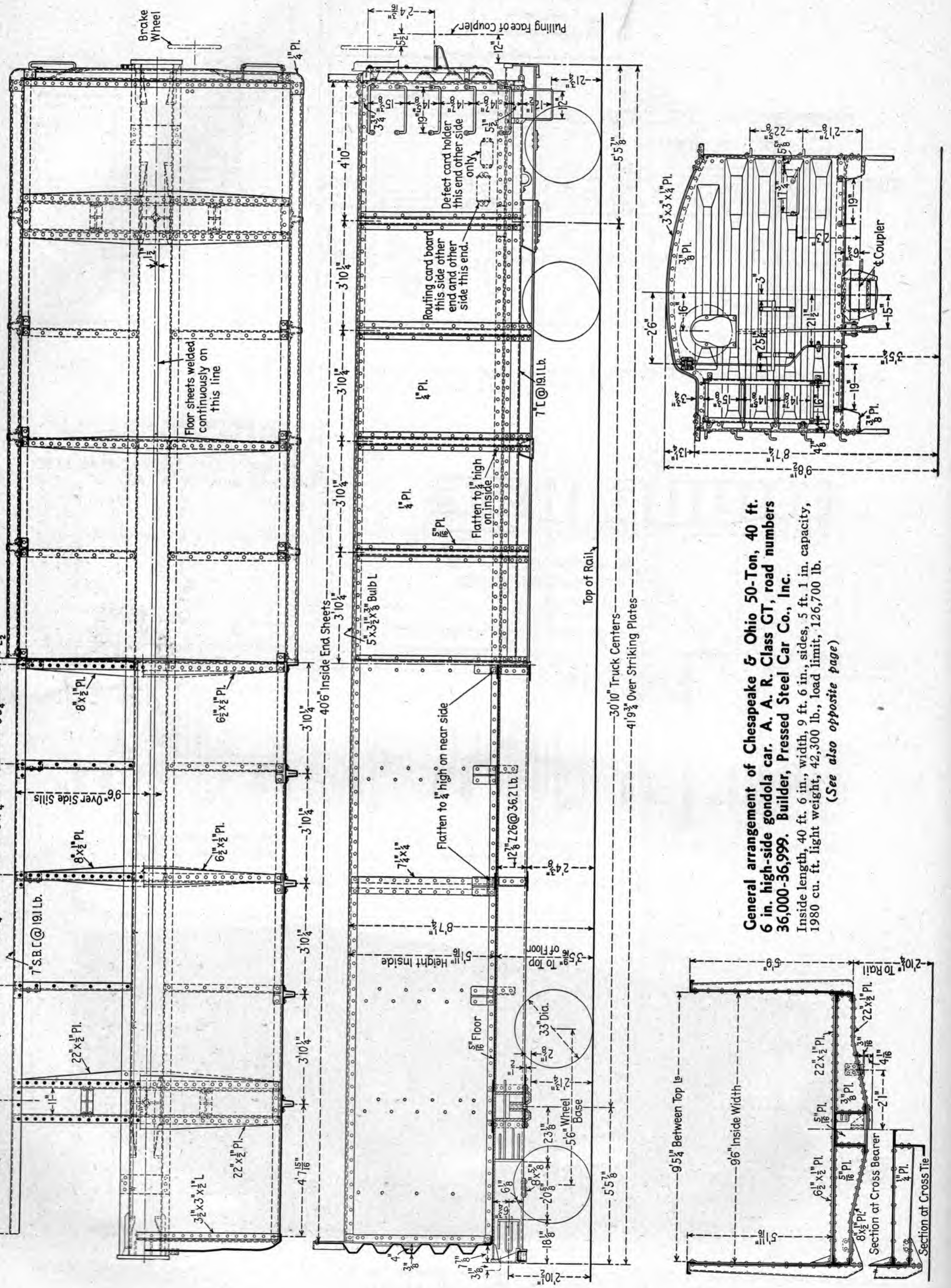


Corrugated steel end for A.A.R. 50-ton, 41 ft. 6 in., light weight gondola car with fixed ends and solid bottom.
A. A. R. Supplement to Manual, Plate 801


NOTE: HORIZONTAL CLIPS ON SIDES AND HOLES IN TOP LEG OF BULB ANGLES TO BE LOCATED ONE FOURTH OF OVERALL DISTANCE FROM ℄ TO ℄ OF SIDE STAKES. DIAGONAL CLIPS TO BE LOCATED AS SHOWN IN "A" AND "B"
℄ OF CAR
1 1/16" DIA. HOLES DRILLED IN TOP LEG OF BULB ANGLE ON CLIP CENTERS
APPLICATION & DETAIL OF HOLD DOWN CLIP
ENLARGED VIEW AT "A" SIDE STAKE AT SLOPE
ENLARGED VIEW AT "B" SIDE STAKE AT SPLICE
WELD

A.A.R. arrangement of hold down clips on gondola cars.

Chicago & North Western 70-ton, 41 ft. 6 in., high-side steel gondola car with fixed ends, solid wood floor and sides of Mayari R high-tensile, low-alloy steel. Builder, Bethlehem Steel Co.
Inside, length 41 ft. 6 in.; width 9 ft. 6 in.; sides 4 ft. 7 in.; capacity 1,807 cu. ft.; light weight 48,600 lb.; load limit 161,400 lb.



General arrangement of Chesapeake & Ohio 50-Ton, 40 ft. 6 in. high-side gondola car. A. A. R. Class GT, road numbers 36,000-36,999. Builder, Pressed Steel Car Co., Inc.

Inside length, 40 ft. 6 in., width, 9 ft. 6 in., sides, 5 ft. 1 in. capacity, 1980 cu. ft. light weight, 42,300 lb., load limit, 126,700 lb.

(See also opposite page)

Chesapeake & Ohio 50 ton, 40 ft. 6 in., all-steel high side gondola car with fixed ends and solid bottom. A. A. R. Class HT, designed to be unloaded by car dumper. Builder, Pressed Steel Car Co., Inc.

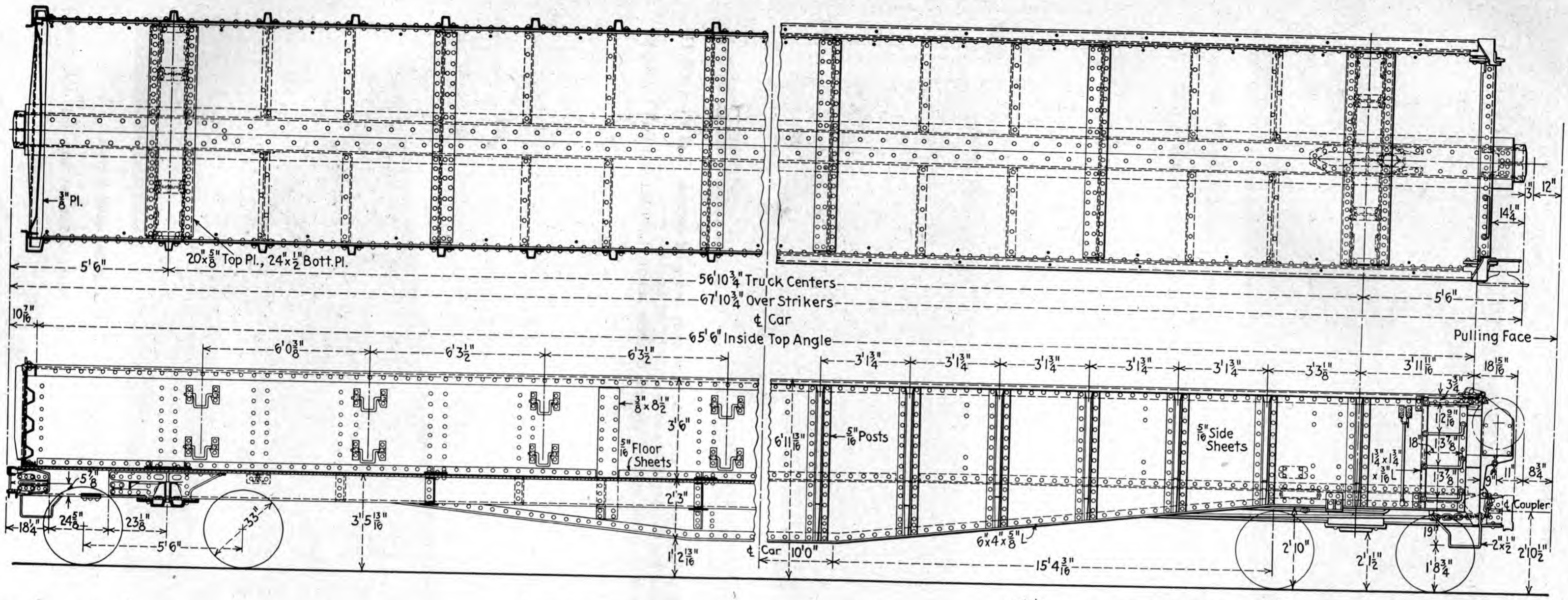
Inside, length 40 ft. 6 in.; width 9 ft. 6 in.; height of sides 5 ft. 0 in.; capacity 1,980 cu. ft.; light weight 42,300 lb.; load limit 126,700 lb.
(*See also drawing opposite page*)

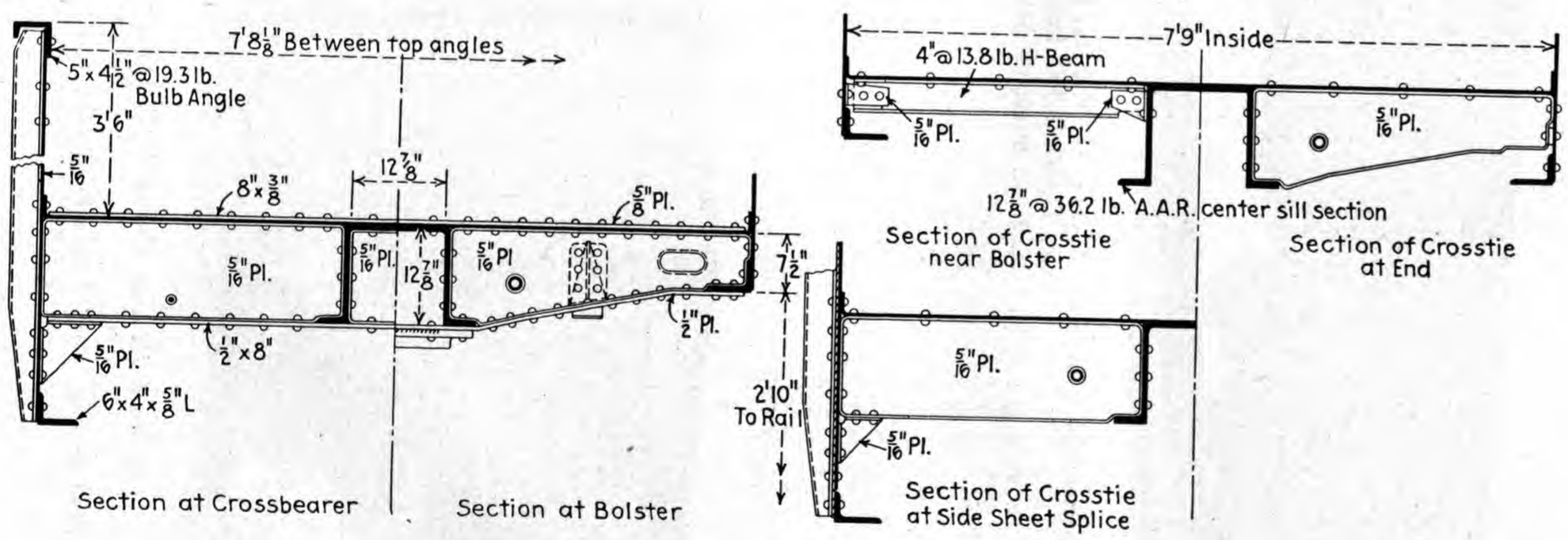
Nashville, Chattanooga & St. Louis 50-ton, 42 ft. 0 in., high side gondola car with fixed ends and solid bottom. Road Class GB-11, series 43,800-43,999. Builder, Pullman-Standard Car Manufacturing Co.

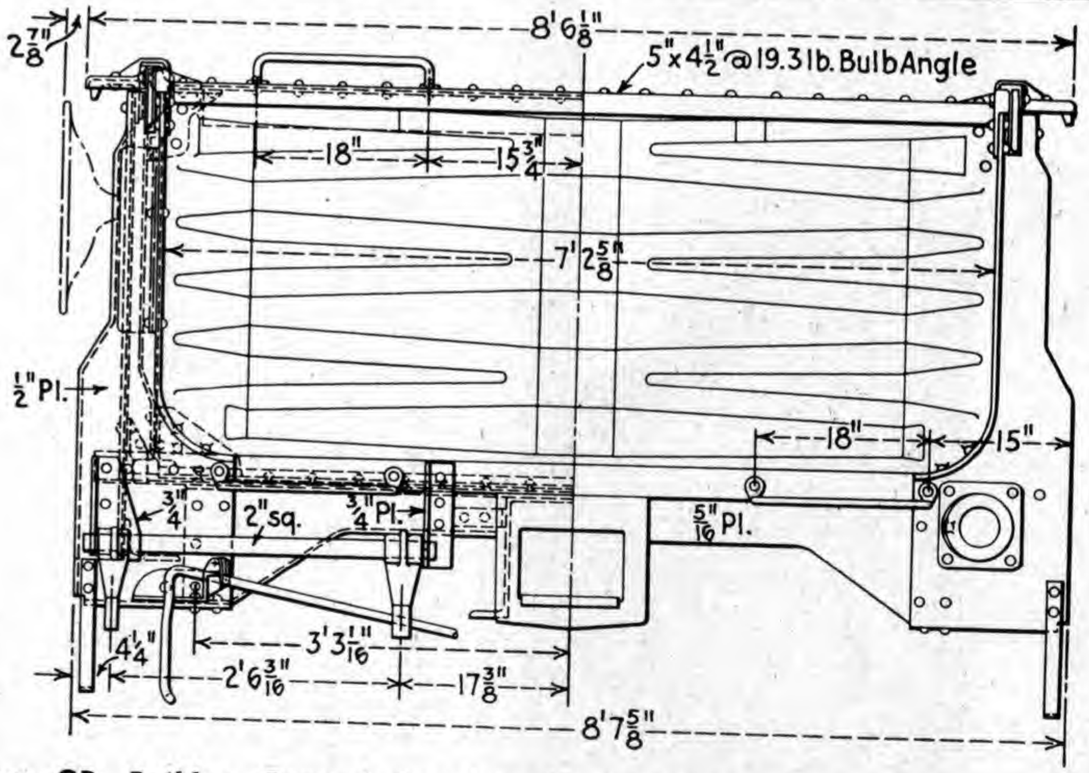
Inside, length 42 ft. 0 in.; width 9 ft. 5 in.; height of sides 4 ft. 8 in.; capacity 1,848 cu. ft.; light weight 41,300 lb.; load limit 127,700 lb.

Seaboard Air Line 50-ton, 41 ft. 6 in., all steel high side gondola car with fixed ends and solid bottom. Builder, American Car and Foundry Co.

Inside, length 41 ft. 6 in.; width 9 ft. 6 in.; height of sides 4 ft. 6 in.; capacity 1,774 cu. ft.; light weight 44,500 lb.; load limit 124,500 lb.





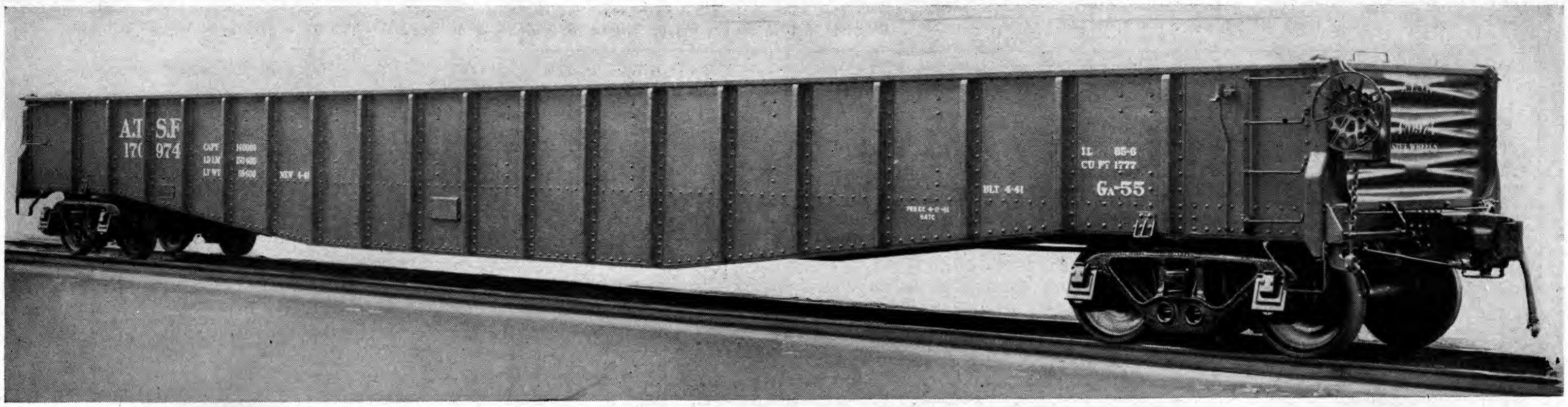


Atchison, Topeka & Santa Fe, Class GA-55, 70-ton 65 ft. 6 in., Mill Type Gondola Car with drop ends. A. A. R. Class GB. Builder, General American Transportation Corp.

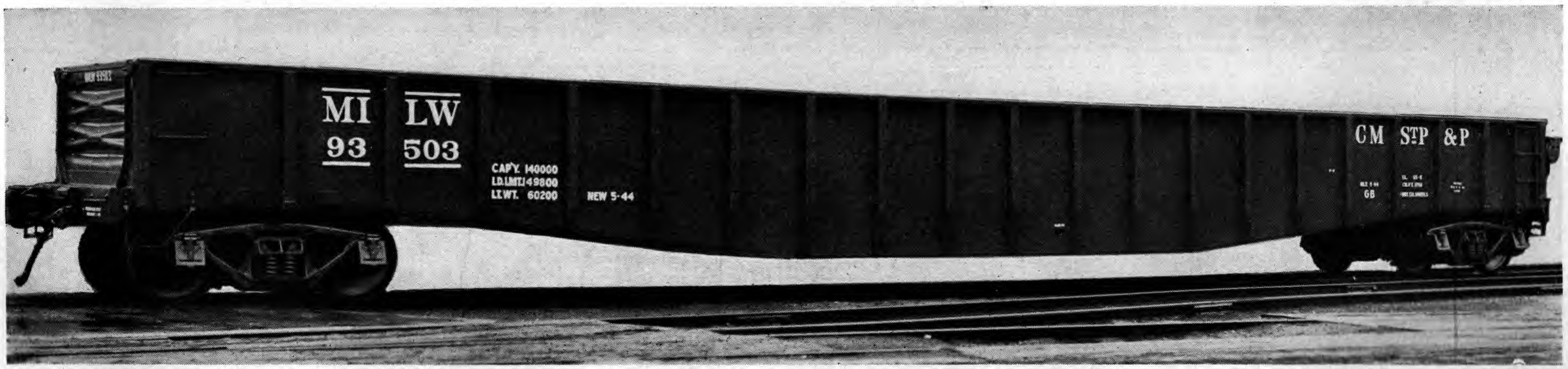
Recommended by A. A. R. Committee on Car Construction, October 1941.

Length, inside 65 ft. 6 in.; width 7 ft. 9 in.; height of sides, 3 ft. 6 in.. capacity, level, 1,777 cu. ft.

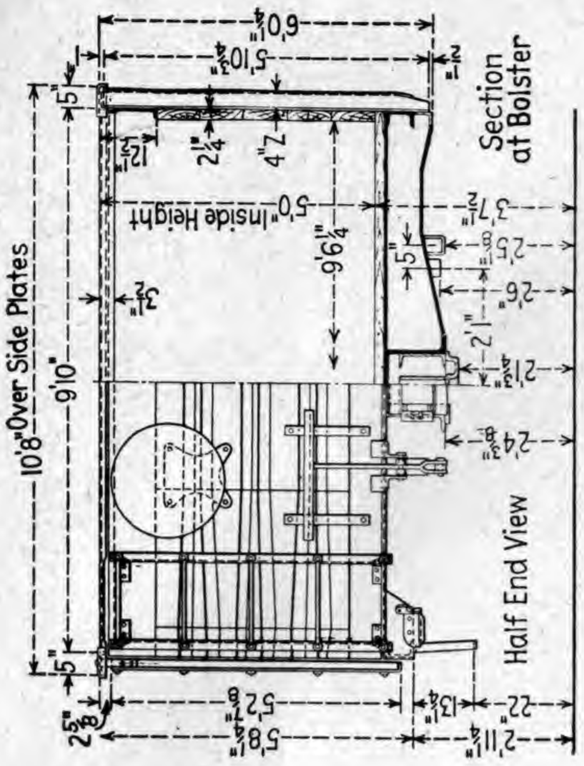
(See also opposite page)

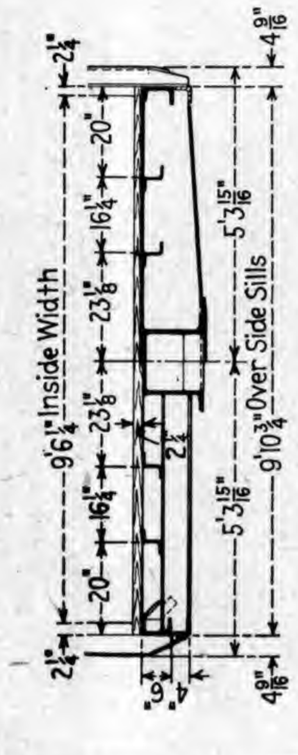


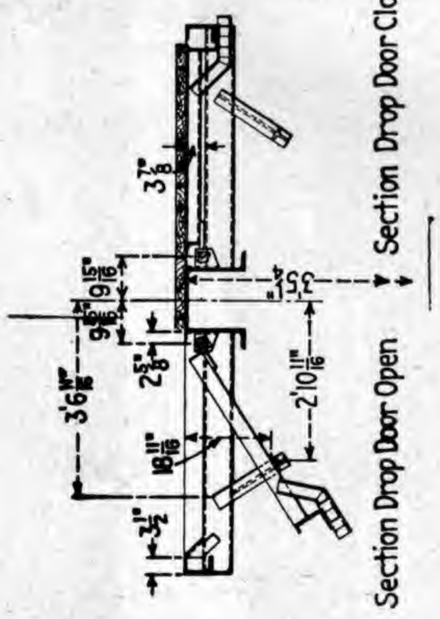
Atchison, Topeka & Santa Fe 70-ton, 65 ft. 6 in., all-steel mill type gondola car with drop ends. Road Class GA-55. Builder, General American Transportation Corporation.
Length inside 65 ft. 6 in.; width 7 ft. 9 in.; height of sides 3 ft. 6 in.; capacity 1,777 cu. ft.; light weight 59,600 lb.; load limit 150,400 lb.
Design recommended by A.A.R. Committee on Car Construction, October 1941.
(See also drawing opposite page)

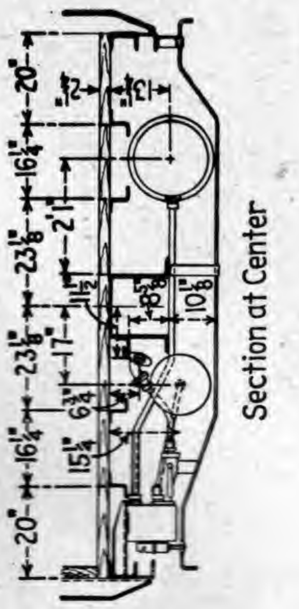


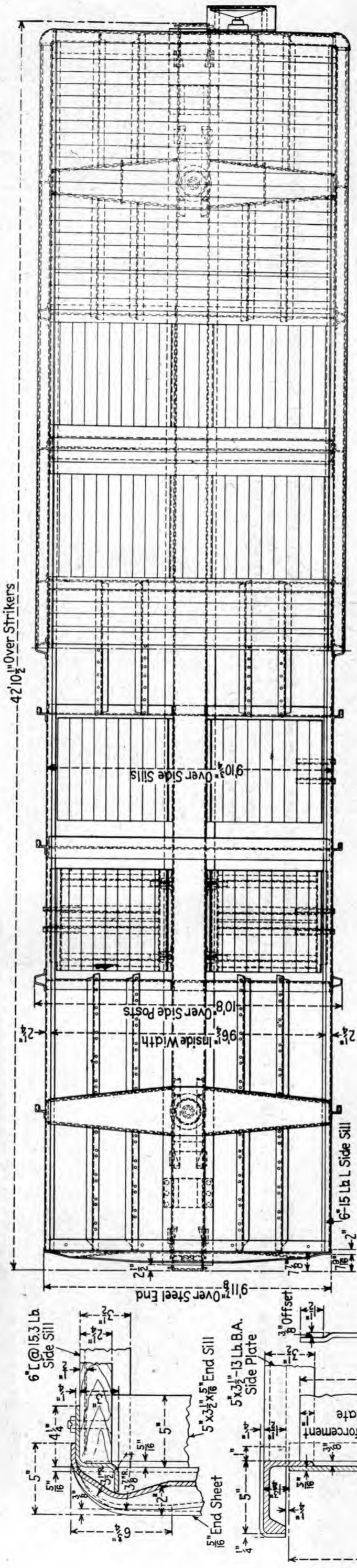
Chicago, Milwaukee, St. Paul & Pacific 70-ton, 65 ft. 6 in., welded-steel gondola car with drop ends and wood floor for mill trade. Series 93,500-93,534, A. A. R. Class GB. Built at railroad shops, Milwaukee.
Inside, length 65 ft. 6 in.; width 7 ft. 8 in.; sides 3 ft. 6 in.; capacity, 1,758 cu. ft.; light weight, 60,200 lb.; load limit, 149,800 lb.





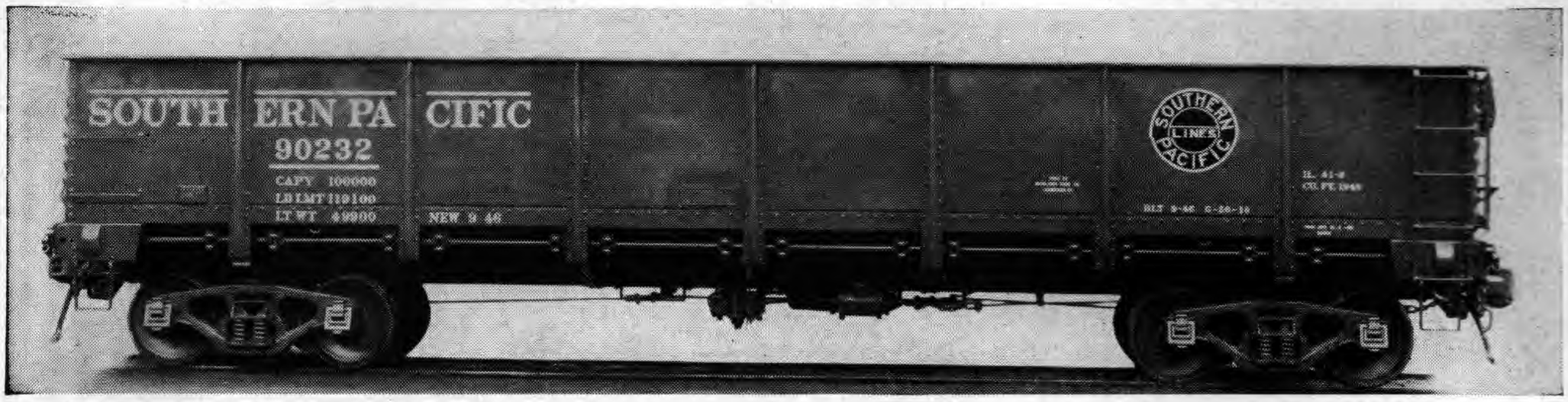




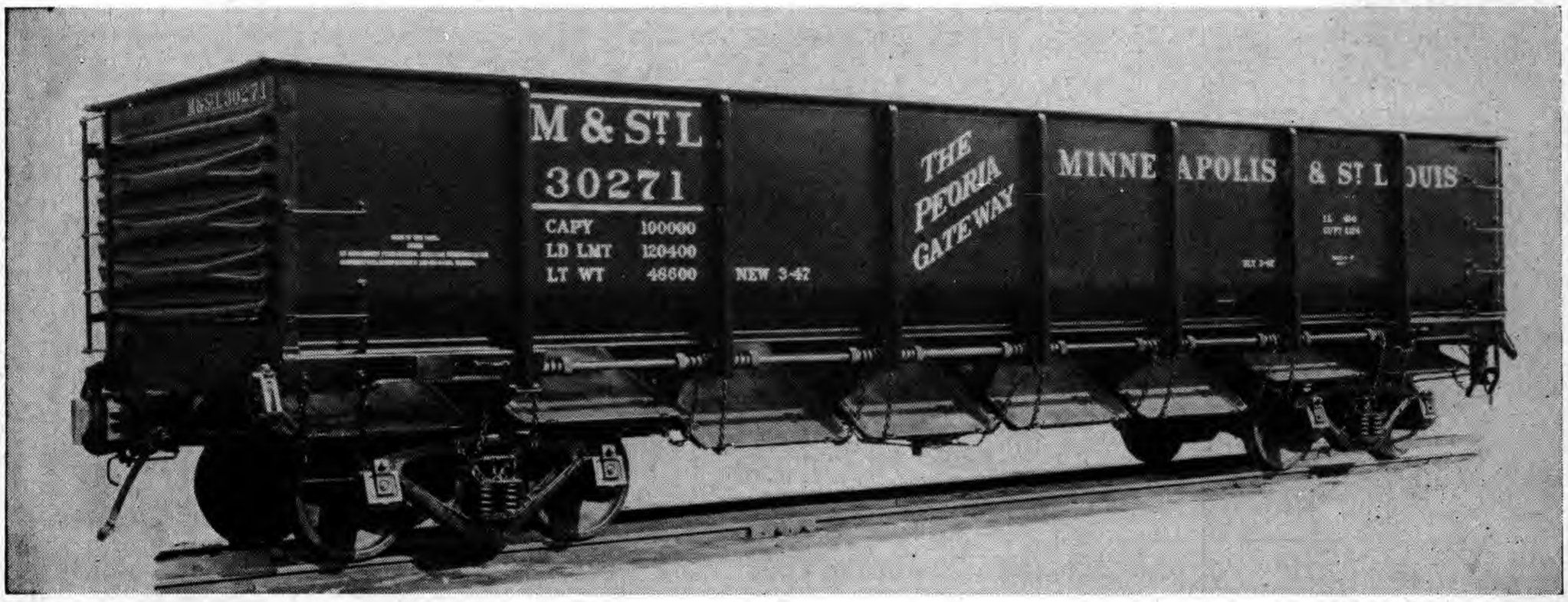


Plan, elevation and sections of Chicago, Milwaukee, St. Paul & Pacific 50-ton, 41 ft. 6 in., composite gondola car with fixed ends and eight bottom doors hinged at center sill. Series 86,150-88,949. Built at Milwaukee shops.

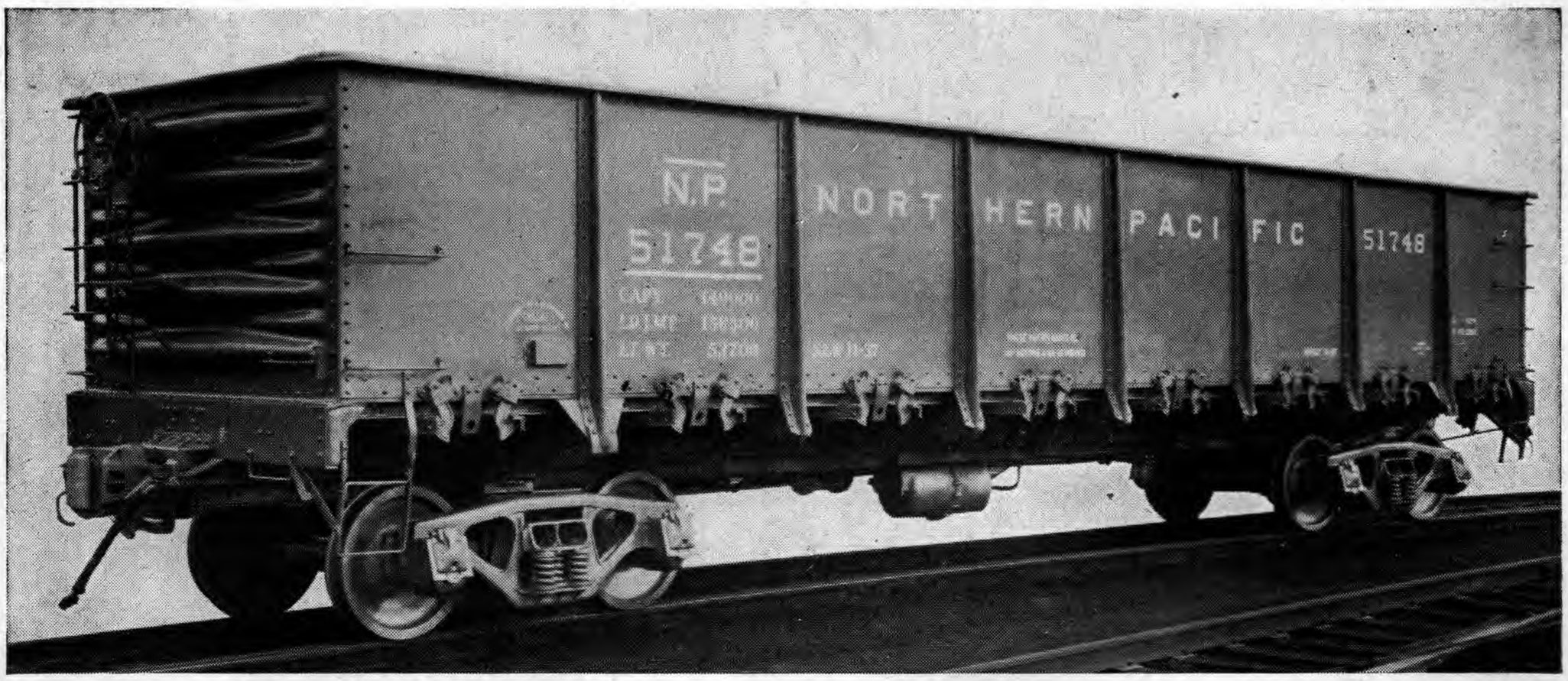
Inside, length 41 ft. 6 in.; width 9 ft. 6¼ in.; height of sides 5 ft. 0 in.; capacity level, 1,840 cu. ft.



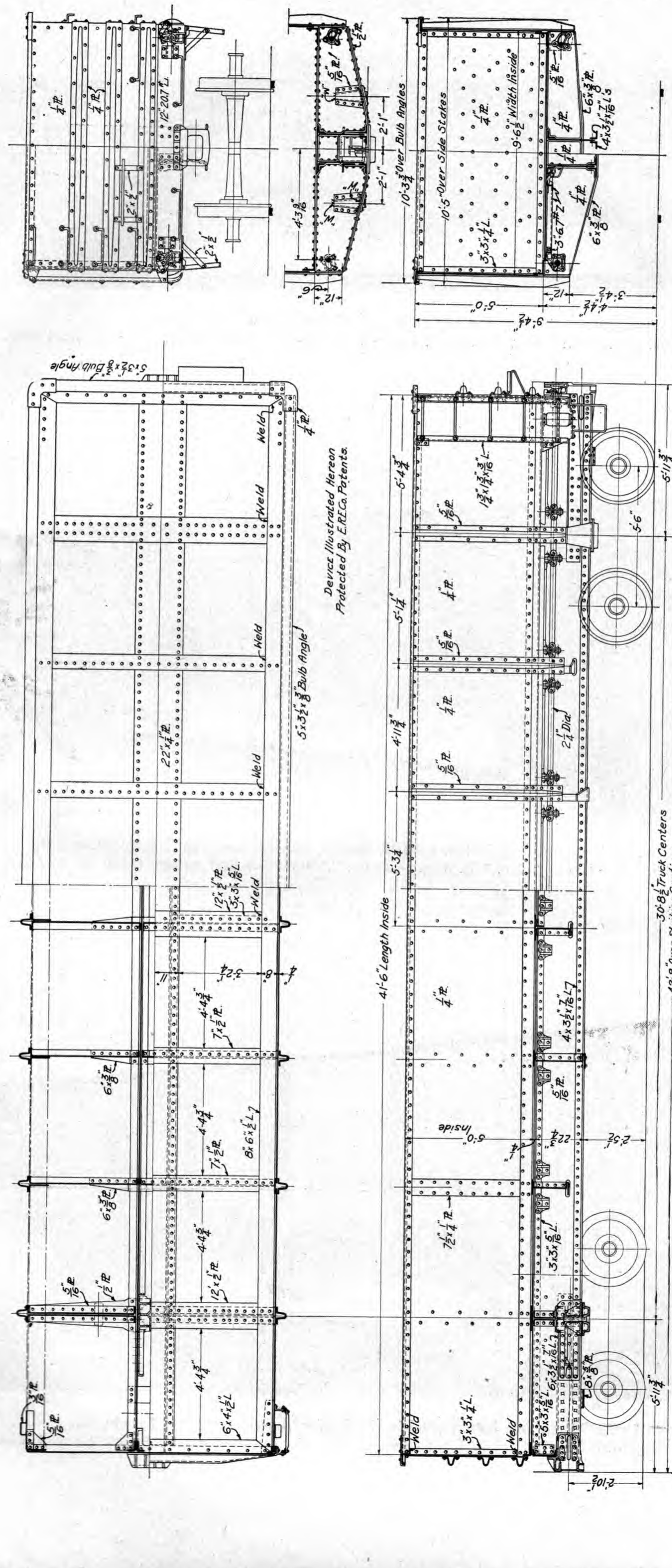
Southern Pacific 50-ton drop bottom gondola. Builder, Bethlehem Steel Co.
Inside length, 41 ft. 0 in.; width, 9 ft. 6 in.; height, 5 ft. 0 in.; capacity, 1,948 cu. ft.; light weight, 49,900 lb.; load limit, 119,100 lb.



Minneapolis & St. Louis 50-ton drop bottom gondola. Builder, General American Transportation Corp.
Inside length, 41 ft. 0 in.; width, 9 ft. 6⅝ in.; height, 5 ft. 6 in.; capacity, 2,124 cu ft.; light weight, 48,600 lb.; load limit, 120,400 lb.

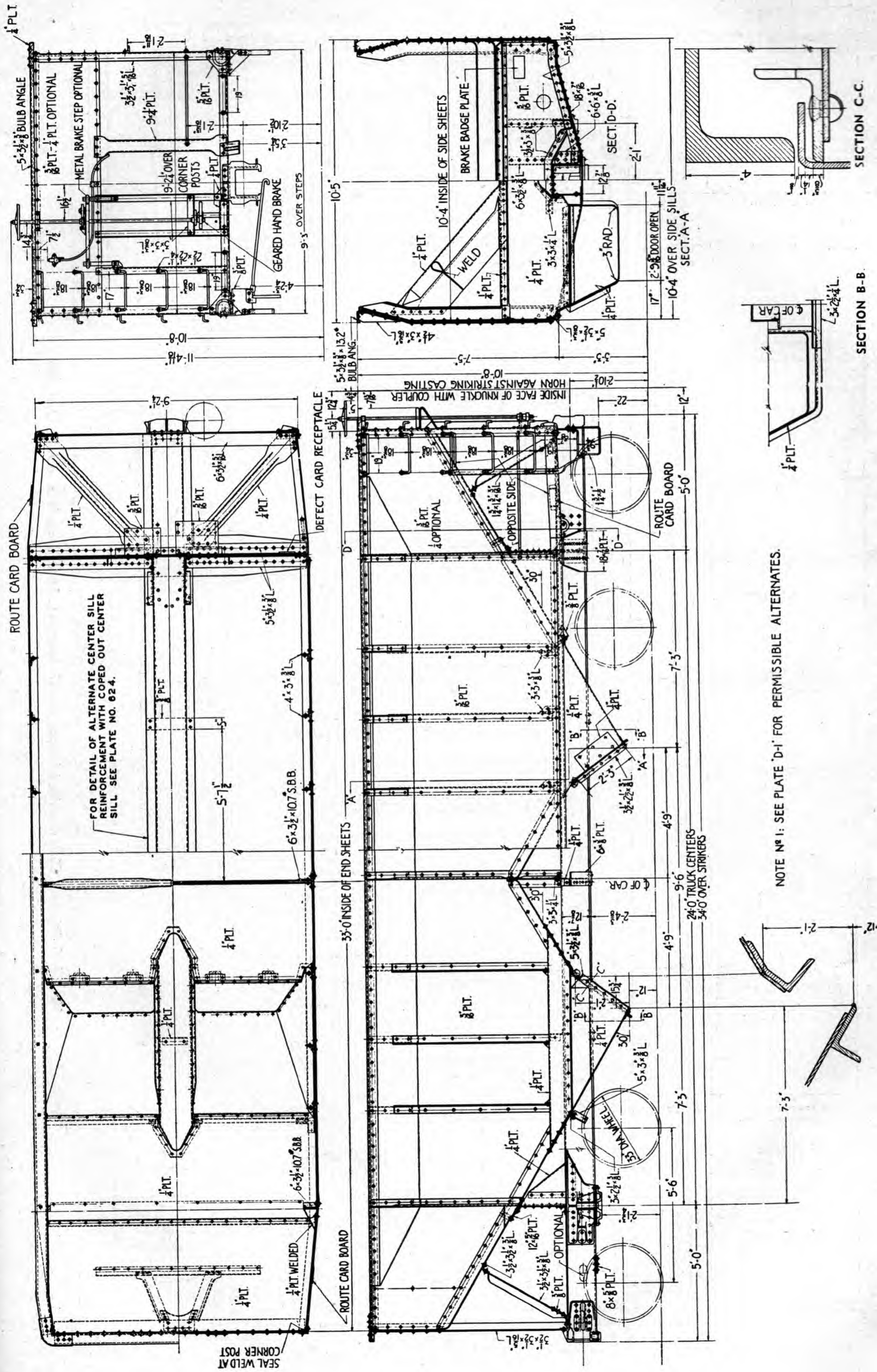


Northern Pacific 70-ton drop bottom gondola car. Builder, American Car and Foundry Co.
Inside length, 42 ft. 0 in.; width, 9 ft. 6 in.; height, 5 ft. 8 in.; capacity, 2,369 cu. ft.; light weight, 53,700 lb.; load limit, 156,300 lb.



55-Ton, 41 ft. 6 in., all-steel 5½ in. by 10 in. axle load Enterprise General Service Gondola Car with fixed ends and 16 drop bottom doors hinged at center sill. A.A.R. Class GS. Cubic capacity, 1,973 cu. ft. level full or 2,366 cu. ft. with 12 in. average heap. Inside: length 41 ft. 6 in., width 9 ft. 6½ in., height sides 5 ft. 0 in.

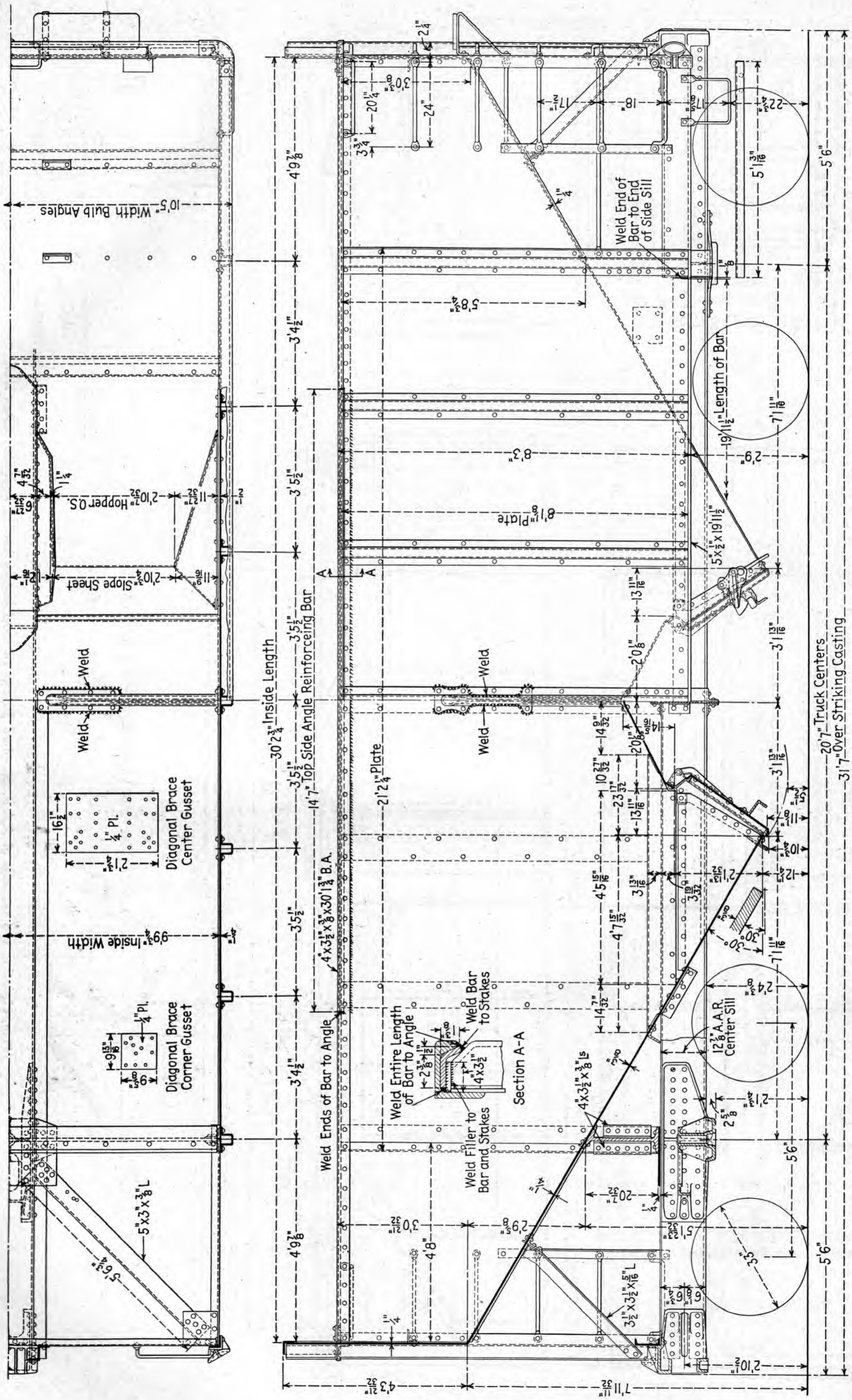
Enterprise Railway Equipment Company



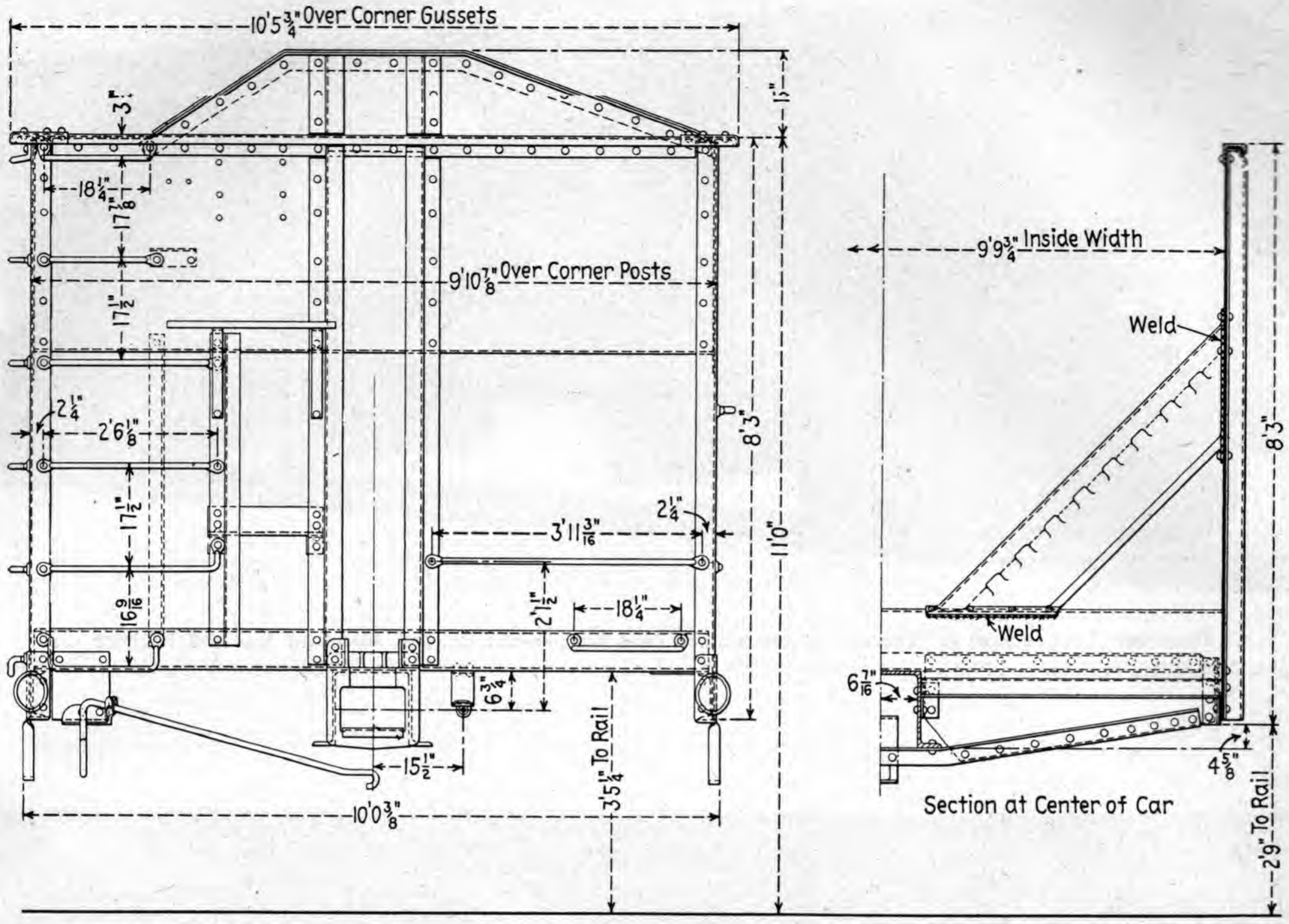
Plan, elevation and sections of A.A.R. Standard 50-ton all-steel hopper car (2 hoppers). Class HM.

Cubic capacity—level full—2145 cu. ft.

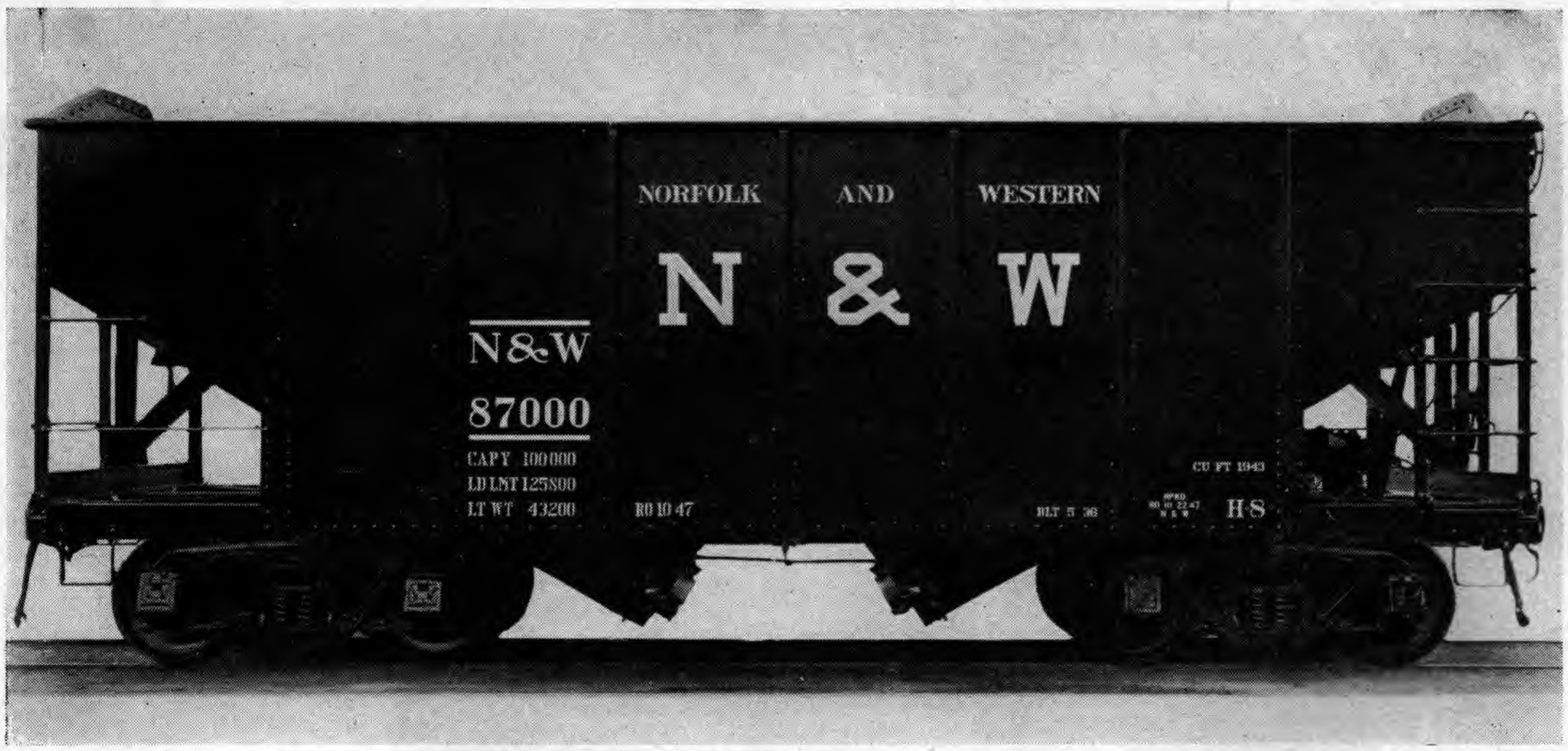
(See A. A. R. Supplement to the Manual, Plate 500-F)



Norfolk & Western 50-ton welded hopper car (2 hoppers), Road Class H-8, A.A.R. Class HM.



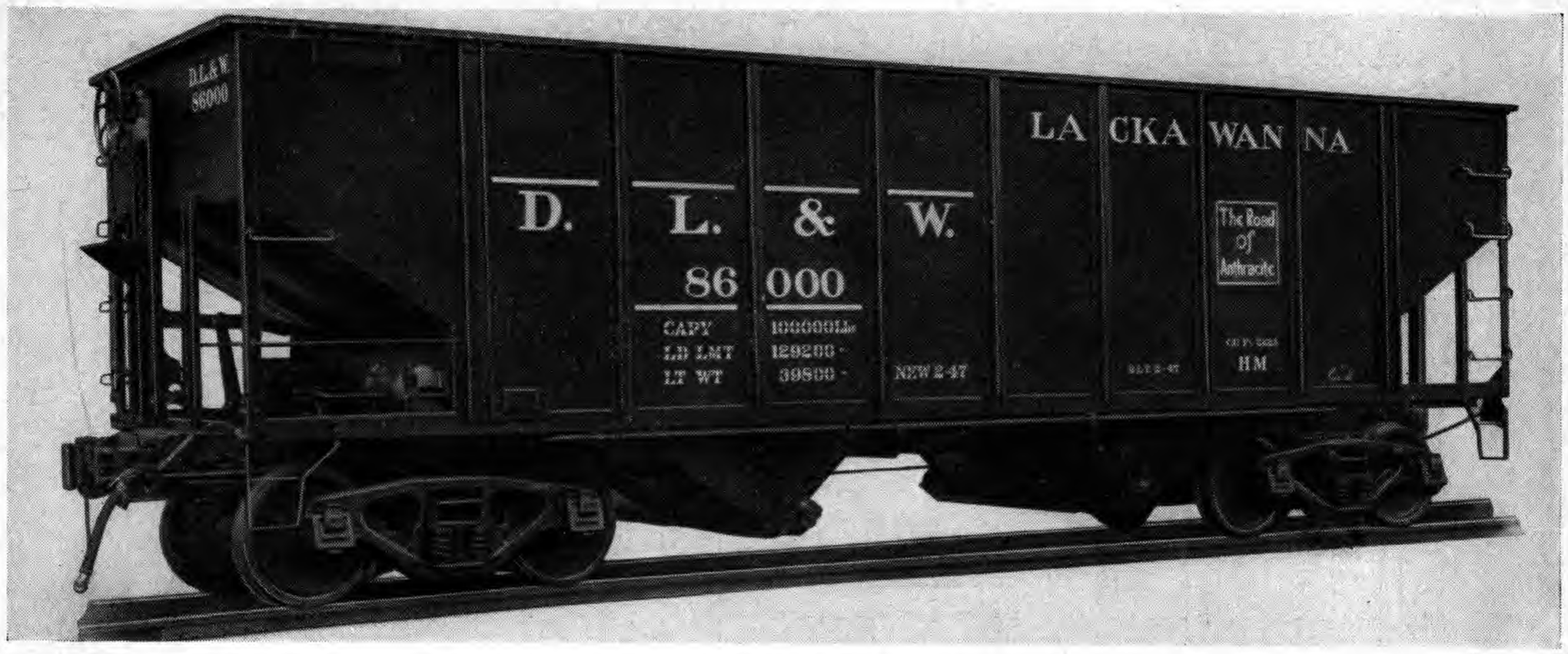
End view and cross section of Norfolk & Western Class H-8 welded hopper car shown on page 220.



Norfolk & Western 50-ton welded hopper car, Road Class H-8, A. A. R. Class HM. Road Numbers 87,000-87,999.

Dimensions and Weights—N. & W. Class H-8 50-Ton Hopper Car

Length over striking plates	31 ft. 7 in.	Outside width	10 ft. 5¾ in.
Truck centers	20 ft. 7 in.	Cubical capacity, level full	1943 cu. ft.
Truck wheel base	5 ft. 6 in.	Weight of empty car (average)	43,200 lb.
Axle journals	5½ in. x 10 in.	Load limit (average)	125,800 lb.
Inside length	30 ft. 2¾ in.	Height from rail to top car side	11 ft. 0 in.
Inside width	9 ft. 9¼ in.	Height from rail to top of car end	12 ft. 3 in.

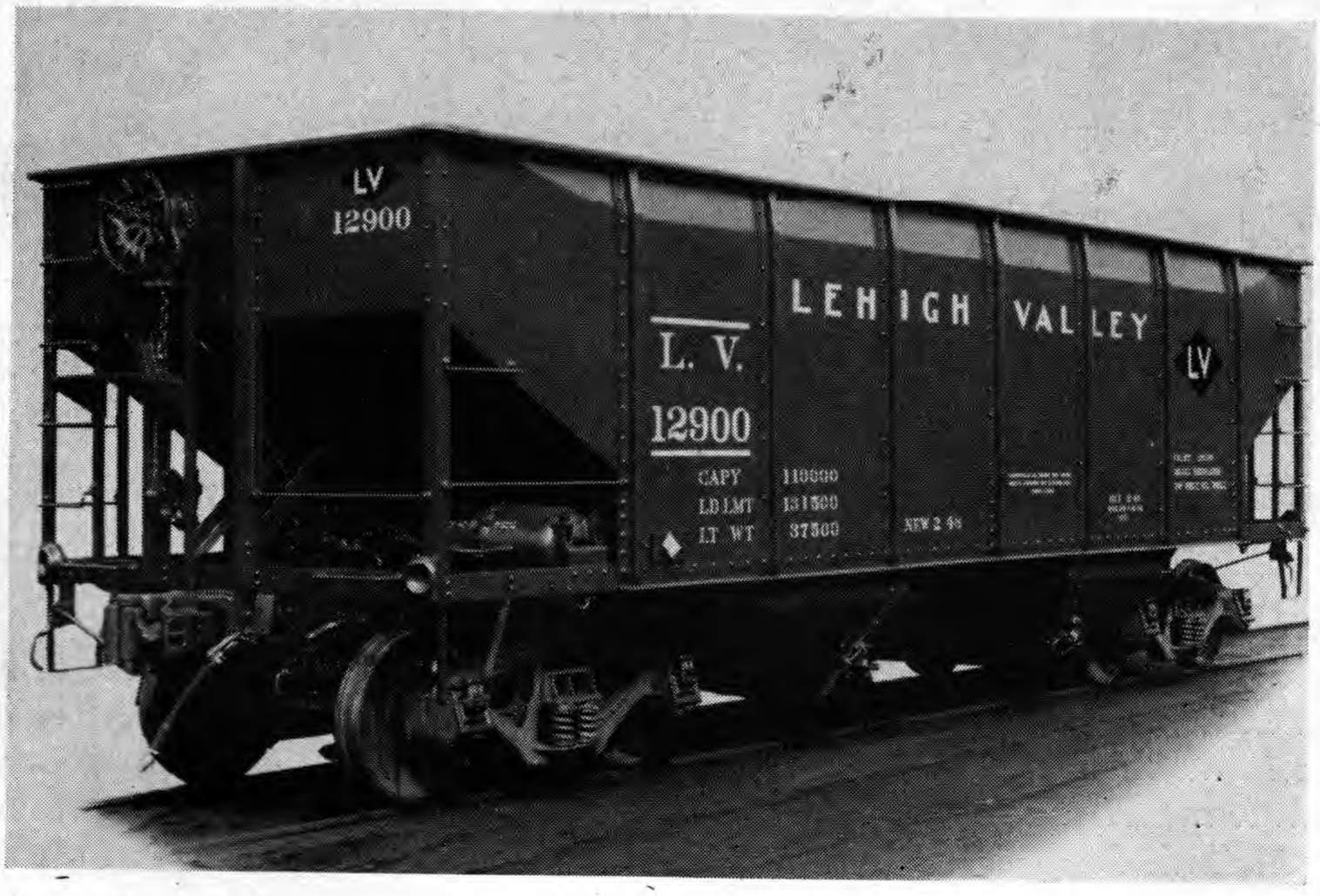


Delaware, Lackawanna & Western 50-ton welded twin hopper car. Builder, American Car and Foundry Co.

Light weight, 39,800 lb.; load limit, 129,200 lb.; capacity, 2,221 cu. ft.; inside, length 34 ft. 4 in.; width 9 ft. 8 in.; height of sides 11 ft. 0 in.

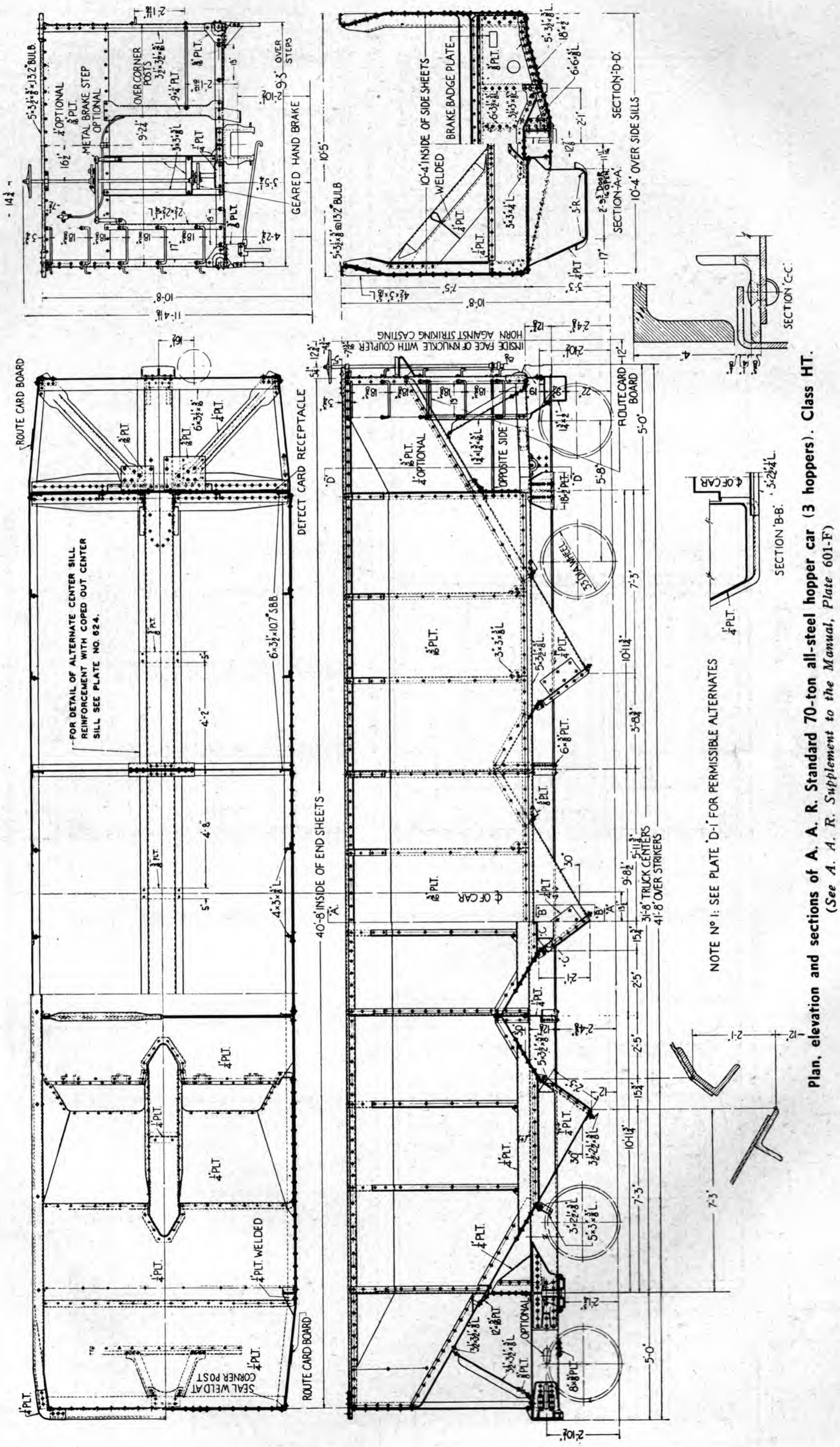
Chicago, Burlington & Quincy 55-ton twin hopper car. Built at railroad shops.

Light weight 38,800 lb.; load limit 130,200 lb.; capacity 2,078 cu. ft.; inside length 34 ft. 3 in.; width 9 ft. 6½ in.; height of sides 10 ft. 9 in

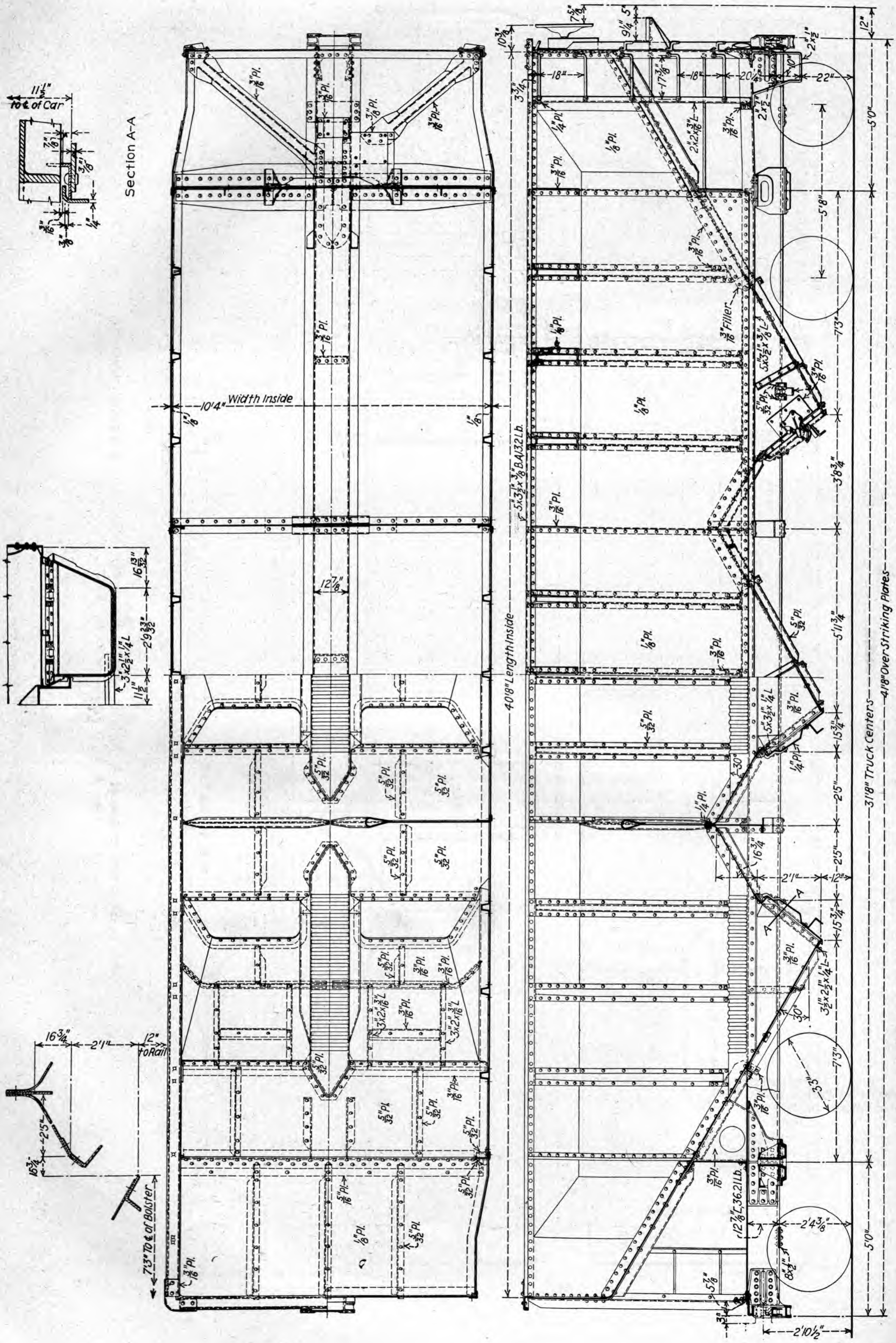


Lehigh Valley 55-ton twin hopper car. Builder, Bethlehem Steel Co.

Light weight 37,500 lb.; load limit 131,500 lb.; capacity 2,080 cu. ft.; inside length 33 ft. 0 in.; width 9 ft. 10½ in.; height of sides 10 ft. 8 in.


OVER CORNER POSTS
METAL BRAKE STEP OPTIONAL
GEARED HAND BRAKE
OVER STEPS
10'-4" INSIDE OF SIDE SHEETS WELDED
BRAKE BADGE PLATE
SECTION 'D-D'
SECTION 'A-A'
10'-4" OVER SIDE SILLS
SECTION 'C-C'
ROUTE CARD BOARD
DEFECT CARD RECEPTACLE
FOR DETAIL OF ALTERNATE CENTER SILL REINFORCEMENT WITH COPED OUT CENTER SILL SEE PLATE NO. 624.
INSIDE FACE OF KNUCKLE WITH COUPLER HORN AGAINST STRIKING CASTING
OPPOSITE SIDE
SECTION 'B-B'
40'-8" INSIDE OF END SHEETS
SEAL WELD AT CORNER POST
31'-8" TRUCK CENTERS
41'-8" OVER STRIKERS
NOTE N° 1: SEE PLATE 'D-1' FOR PERMISSIBLE ALTERNATES

Plan, elevation and sections of A. A. R. Standard 70-ton all-steel hopper car (3 hoppers). Class HT.
(See A. A. R. Supplement to the Manual, Plate 601-F)



Bessemer & Lake Erie 90-ton triple hopper car, light weight (USS Cor-Ten steel). 6½ in. x 12 in. Journal Axles. Road Class HT17.

(Note—Cars of 70 tons capacity were also built. These differed only in having trucks with 6 in. x 11 in. axles.)

(See also Page 225)

Bessem
weigh
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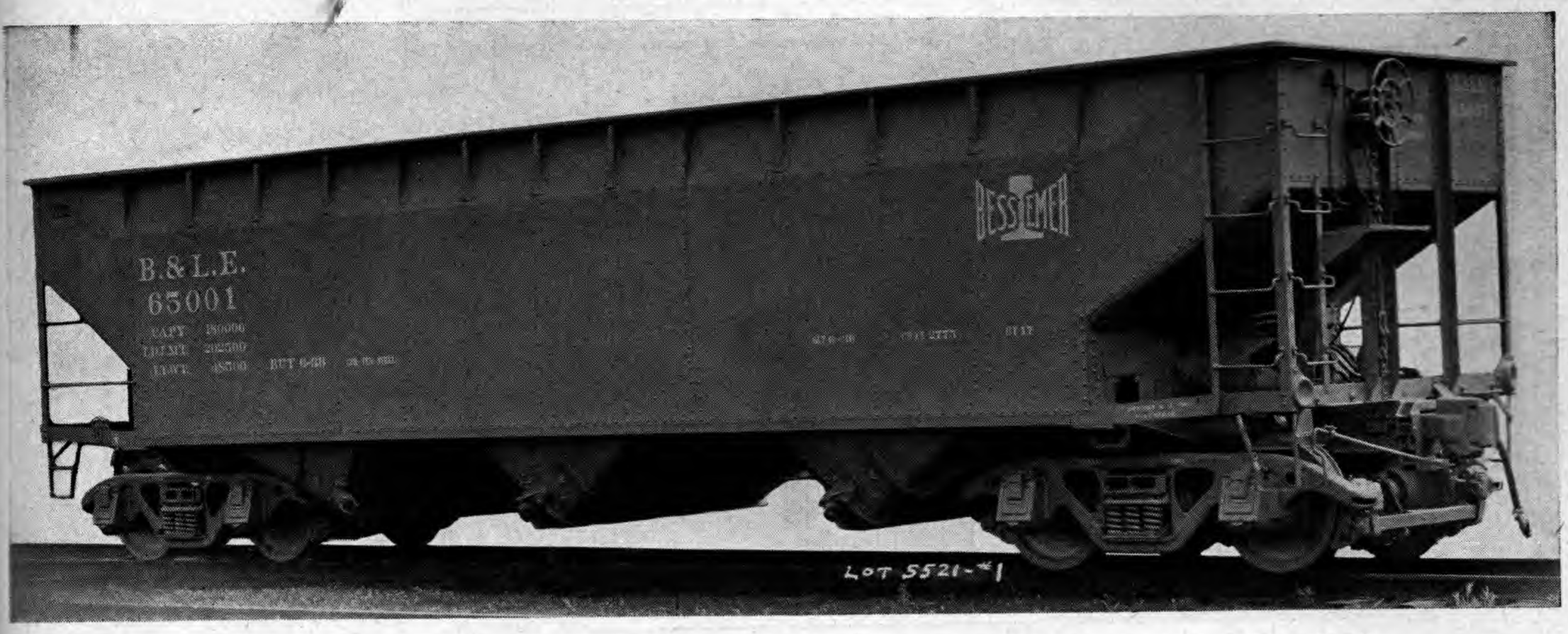
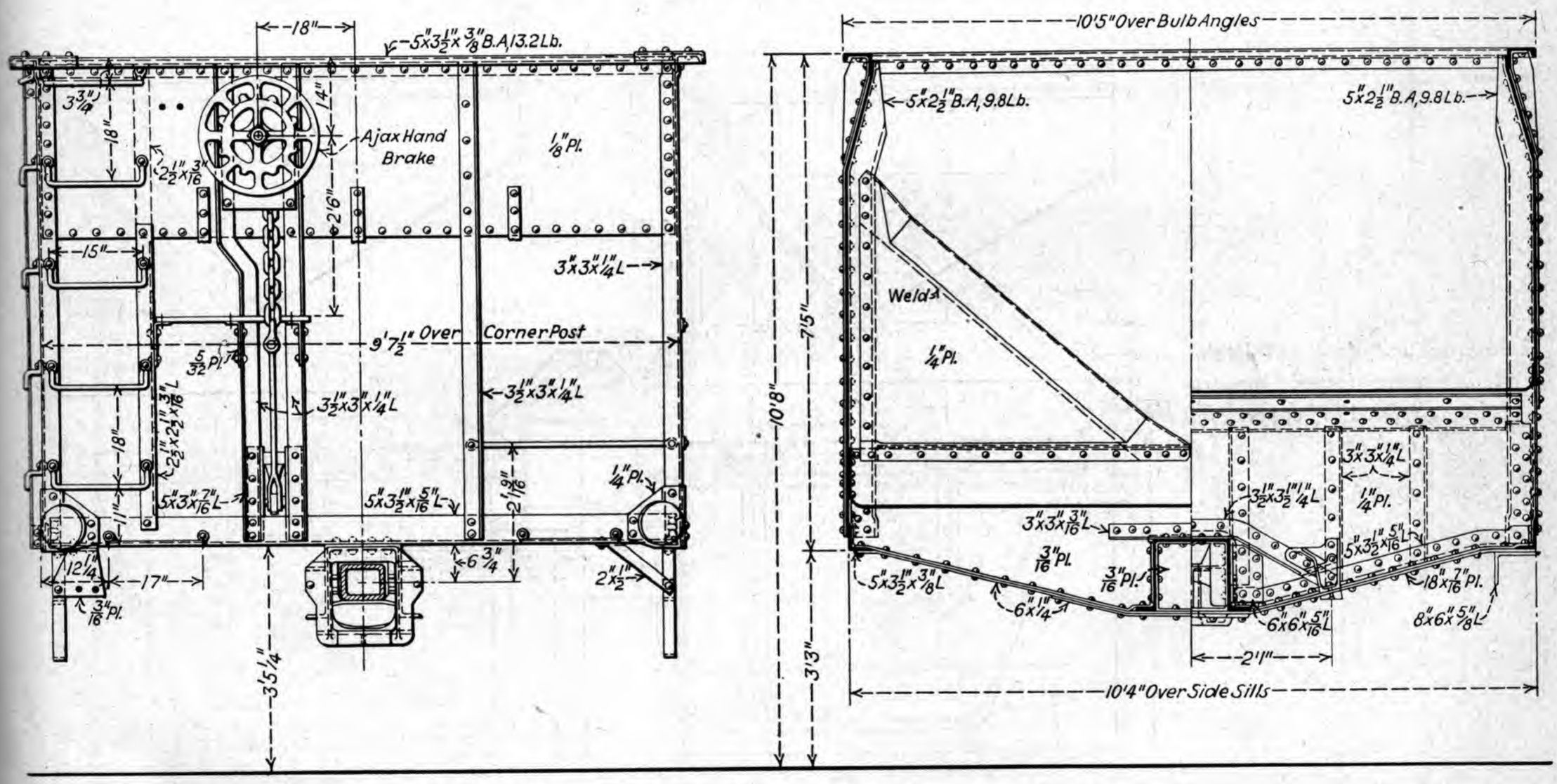
Width
Heigh
Light
Load
Capac



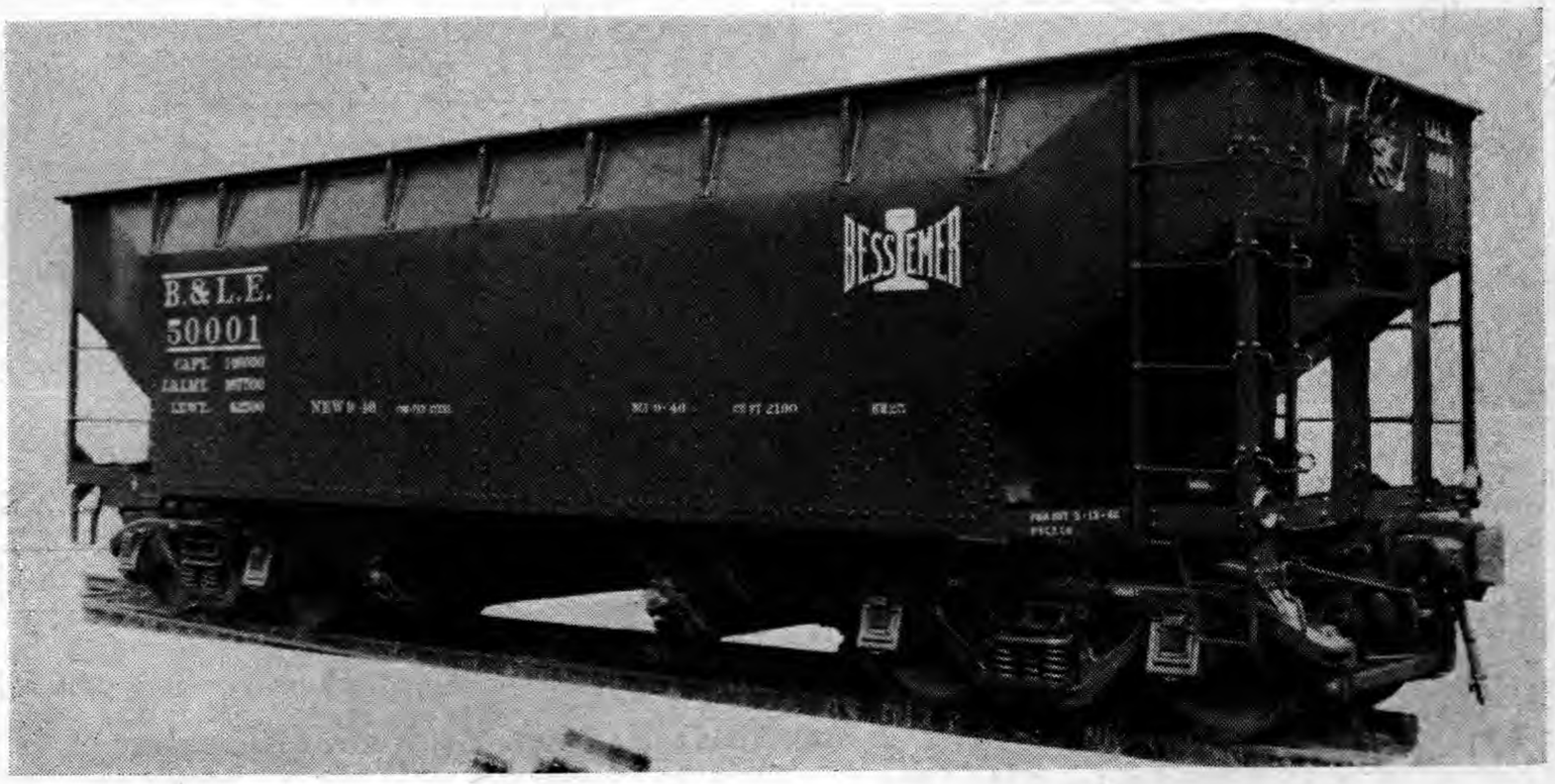
Bessemer & Lake Erie 90-ton light weight triple hopper car. Built of USS Cor-Ten steel, Road Class HT17.
Light weight, 48,500 lb.; load limit, 202,500 lb.; capacity, 2,775 cu. ft.; axle journals, 6½ in. x 12 in.
Also built in 70-ton capacity with 6 in. x 11 in. journals, Road Class H16. See Fig. 2.642.
NOTE: Earlier 90-ton cars of carbon steel weighed 58.800 lb. with load limit 192,200 lb.
(See also Page 224)

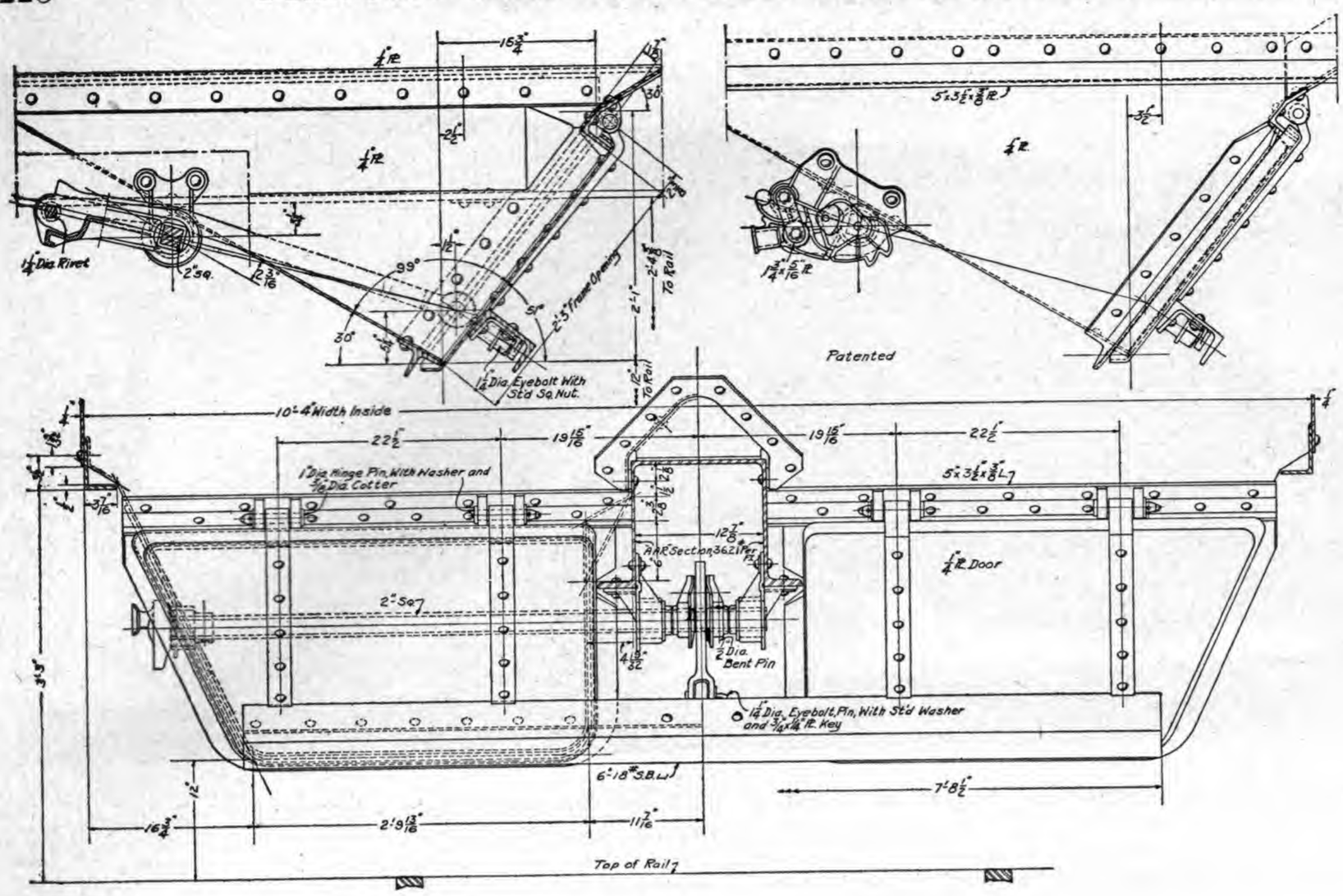


End elevation and cross section of B. & L. E. 70-ton and 90-ton cars.

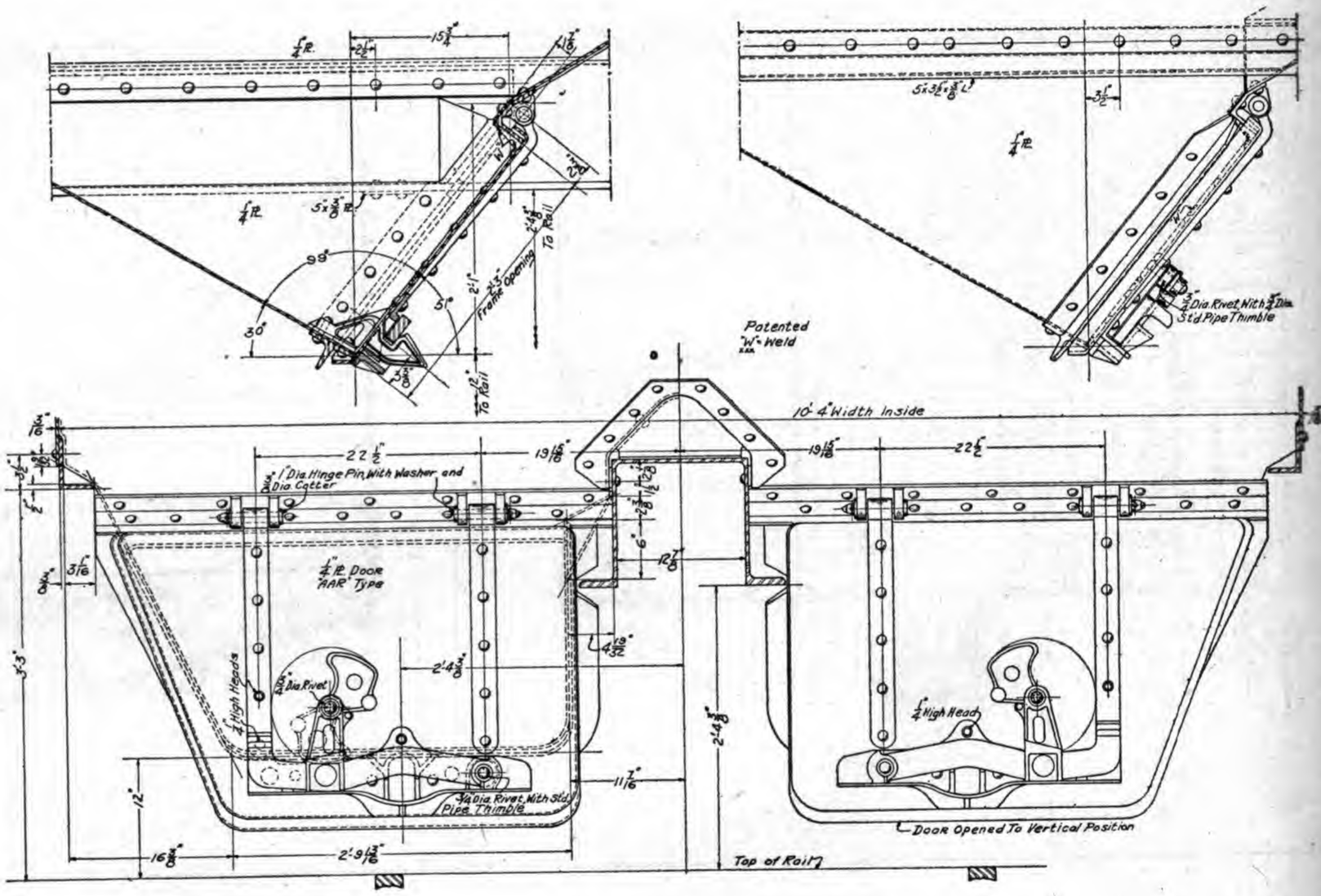
Bessemer & Lake Erie 70-ton light weight twin hopper car of USS Cor-Ten steel. Road Class HM25. Series 50,001-50,750.

Length inside	33 ft. 0 in.
Width inside	10 ft. 4 in.
Height of sides	9 ft. 8 in.
Light weight	42,500 lb.
Load limit	167,500 lb.
Capacity	2,190 cu. ft.

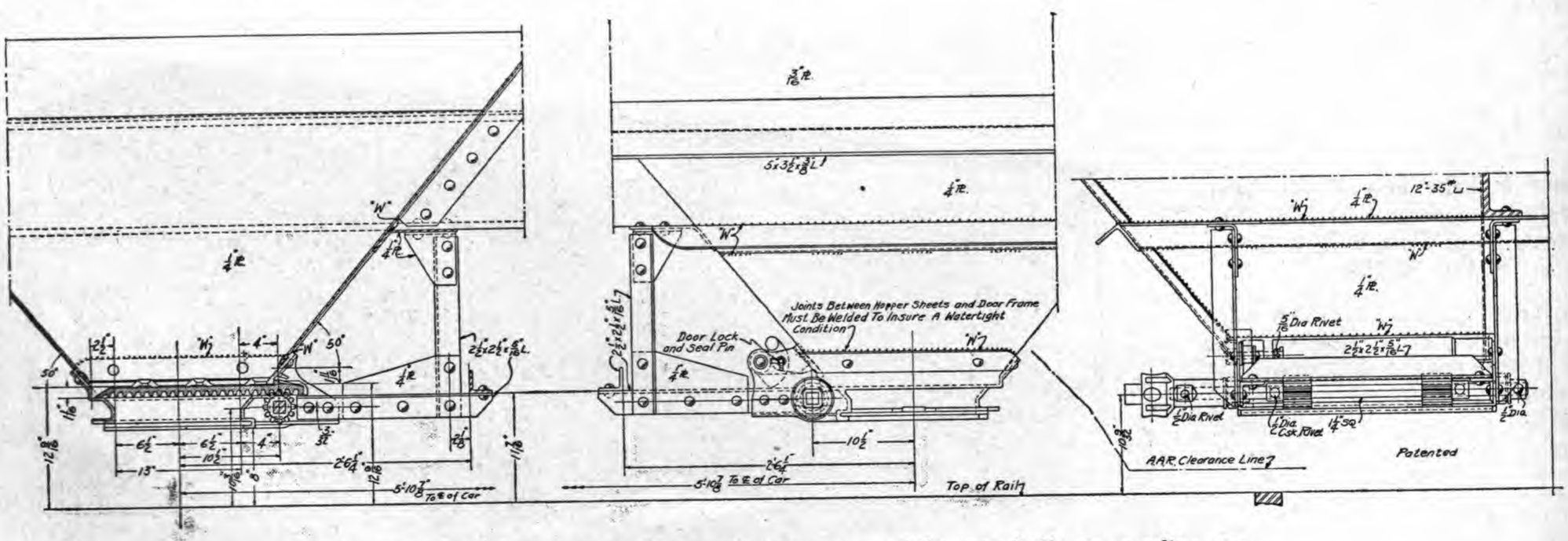




Application of Enterprise Type D door operating mechanism and Enterprise forged hopper frame to hopper coal cars.

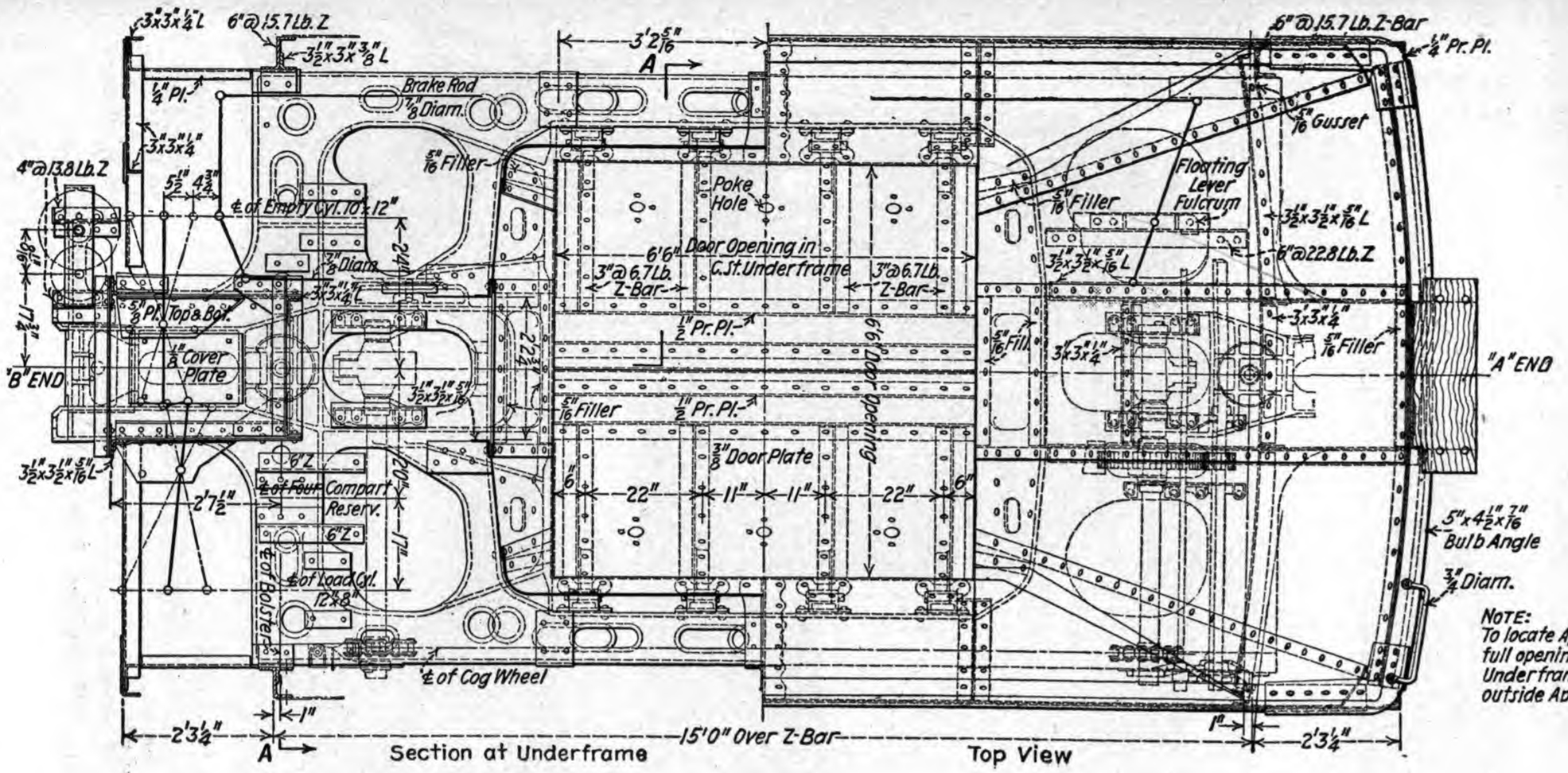


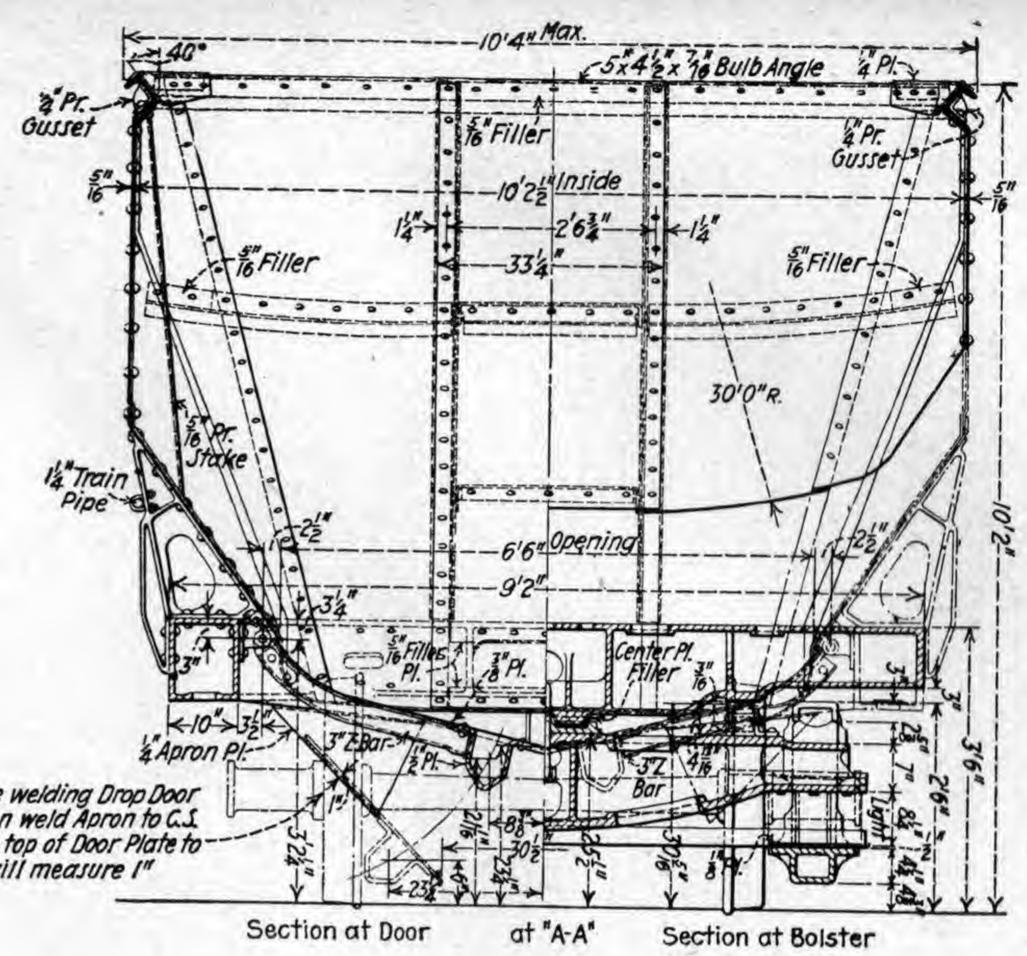
Enterprise unit door and latch and Enterprise forged hopper frame applied to hopper coal cars.

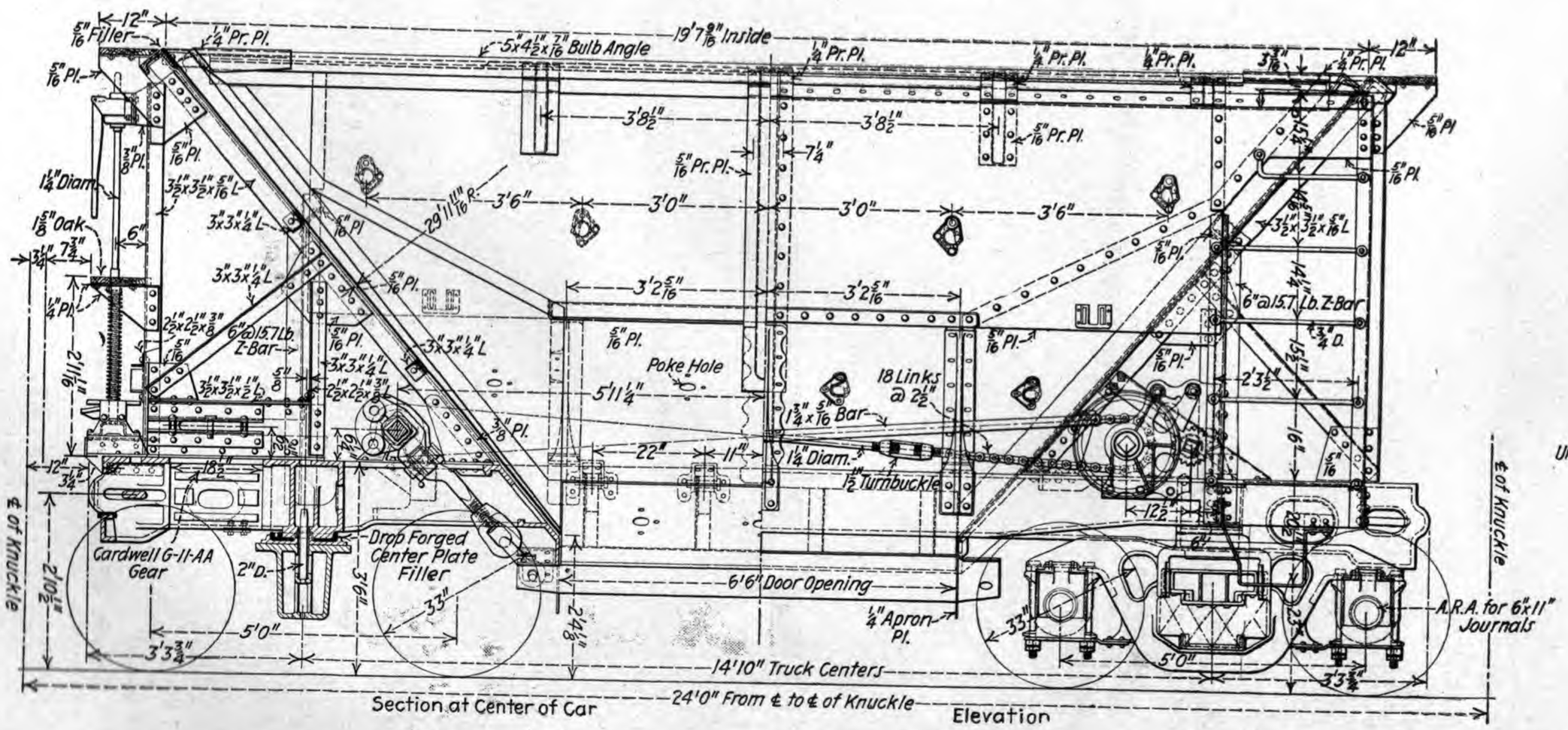


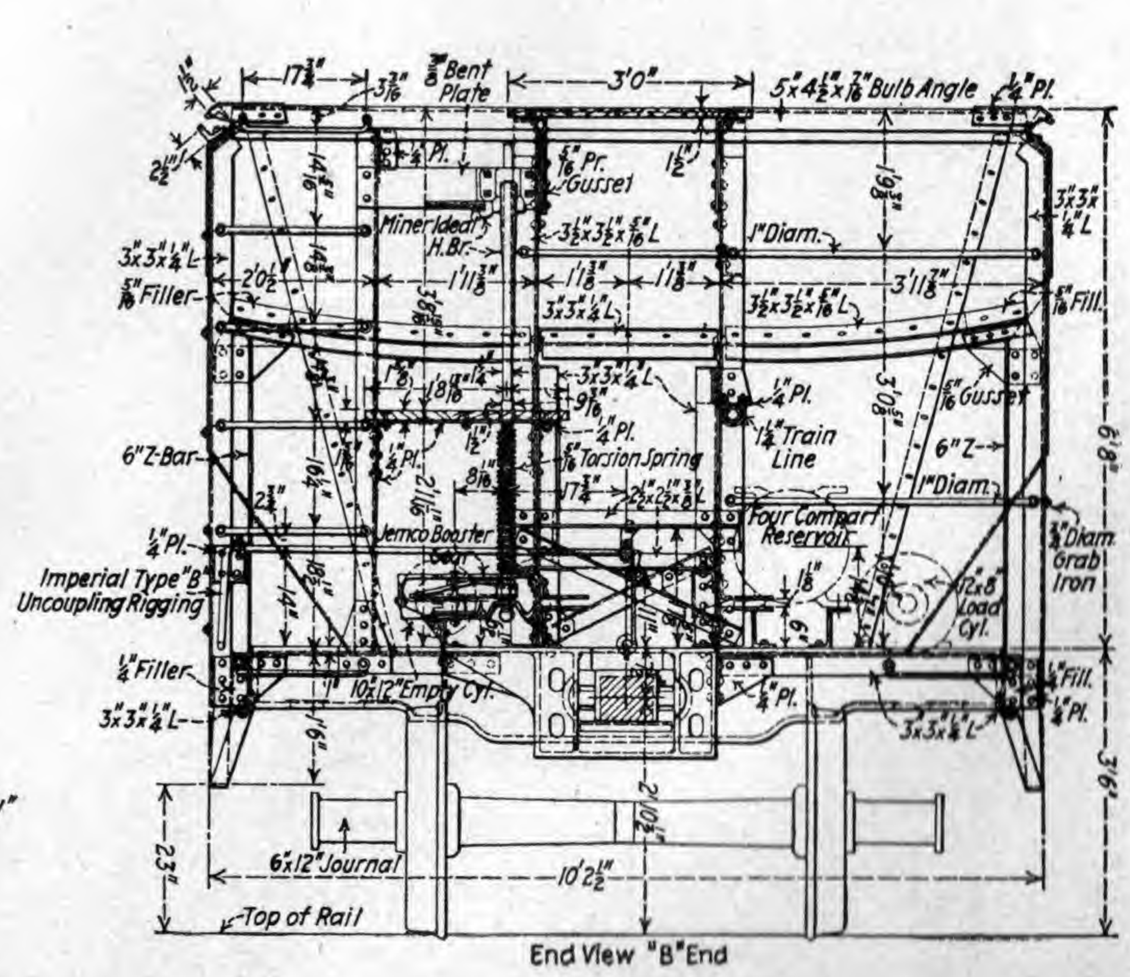
Enterprise cast frame and gate applied to covered hopper bulk commodity car.

Enterprise Railway Equipment Company.

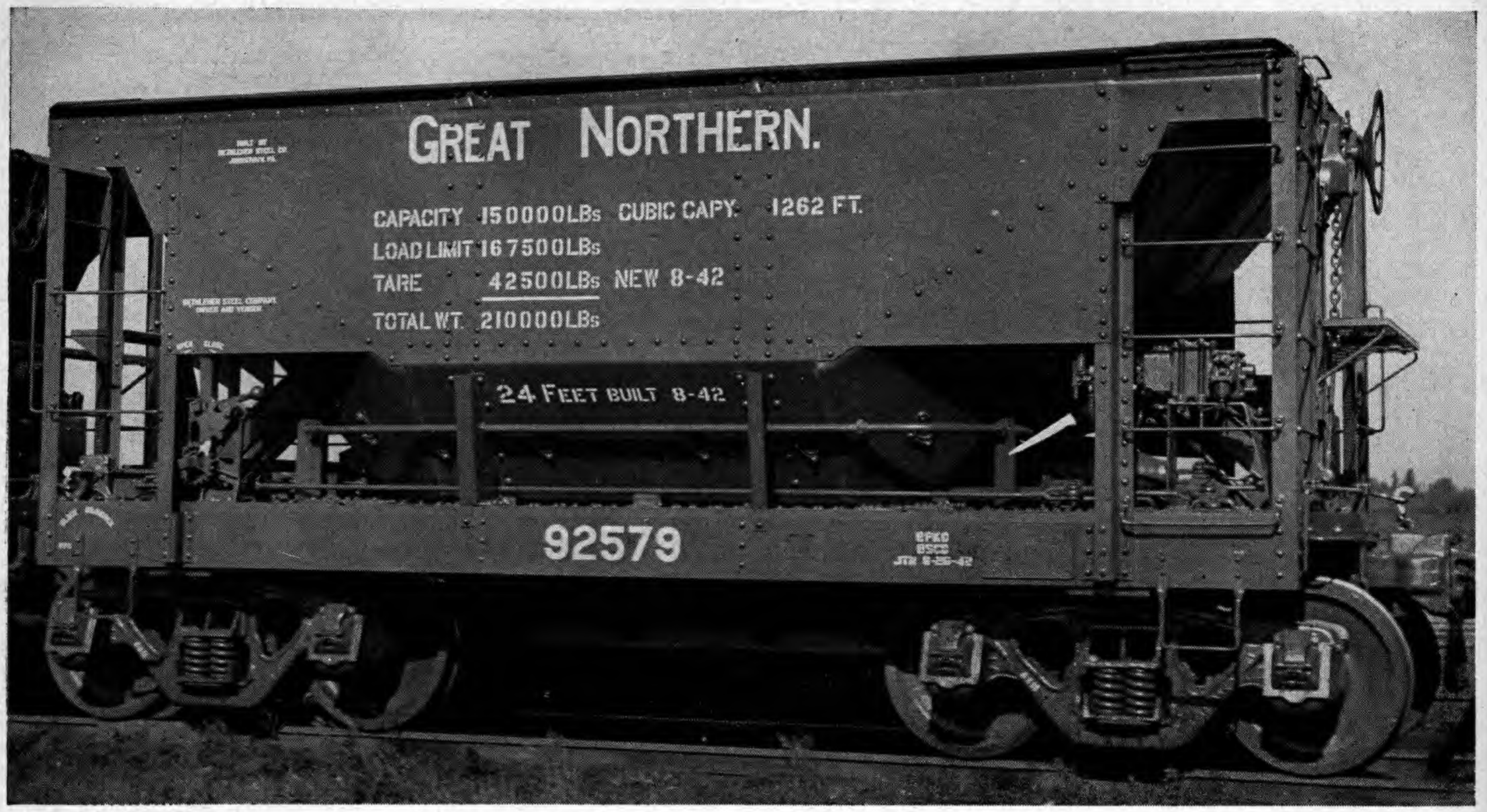



Section at Door
at "A-A"
Section at Bolster
10'4" Max.
10'2½" Inside
30'0" R.
6'6" Opening
NOTE:
To locate Apron before welding Drop Door full opening 30½ then weld Apron to C.I. Underframe so that top of Door Plate to outside Apron Web will measure 1"



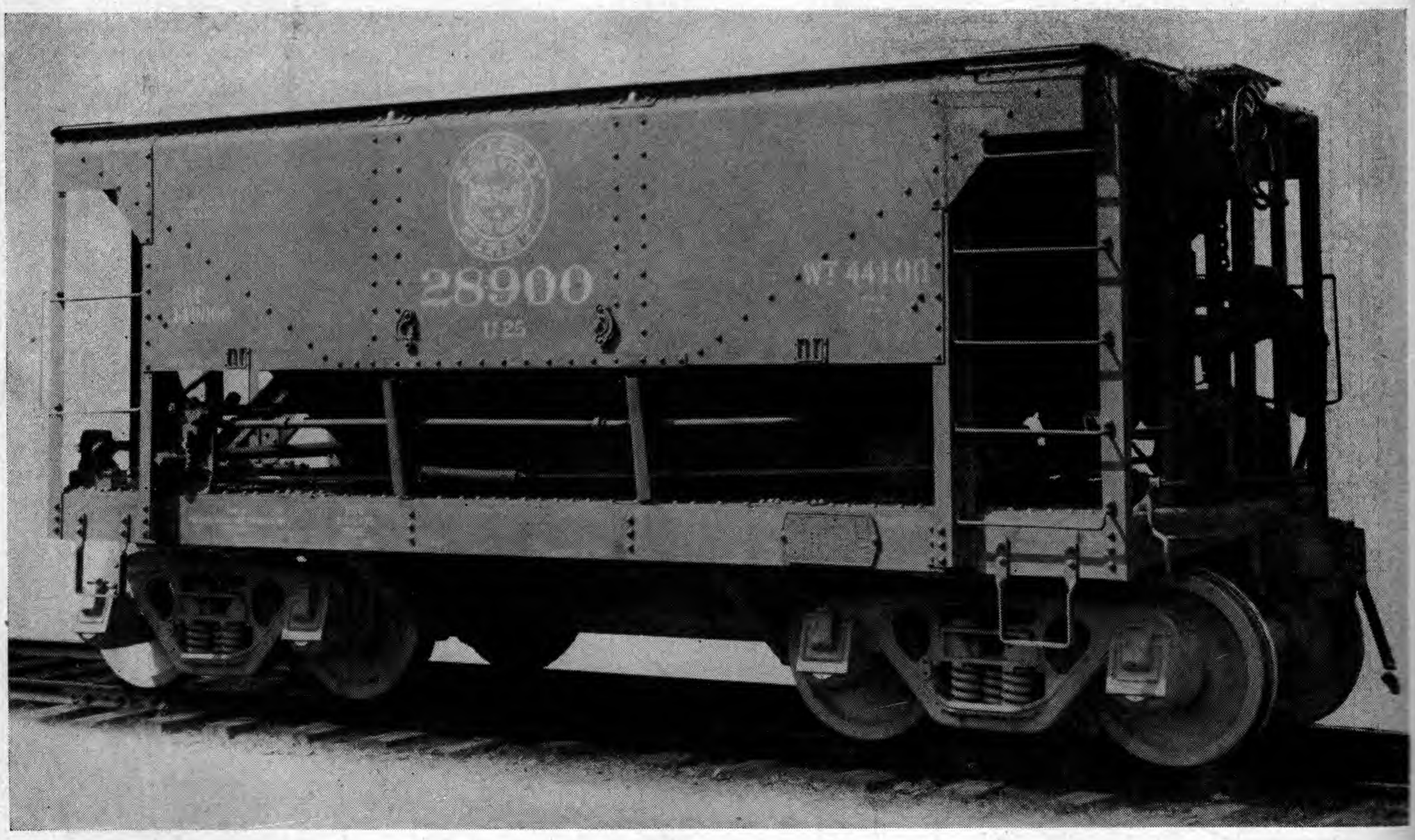


Plan, elevation and sections of Duluth, Missabe & Iron Range 80-ton capacity hopper ore car with Commonwealth one-piece cast steel underframe. Road Class U-14.
Roads Nos. 22,001-22,125; capacity, 935 cu. ft.; light weight, 47,600 lb.; load limit, 162,400 lb.



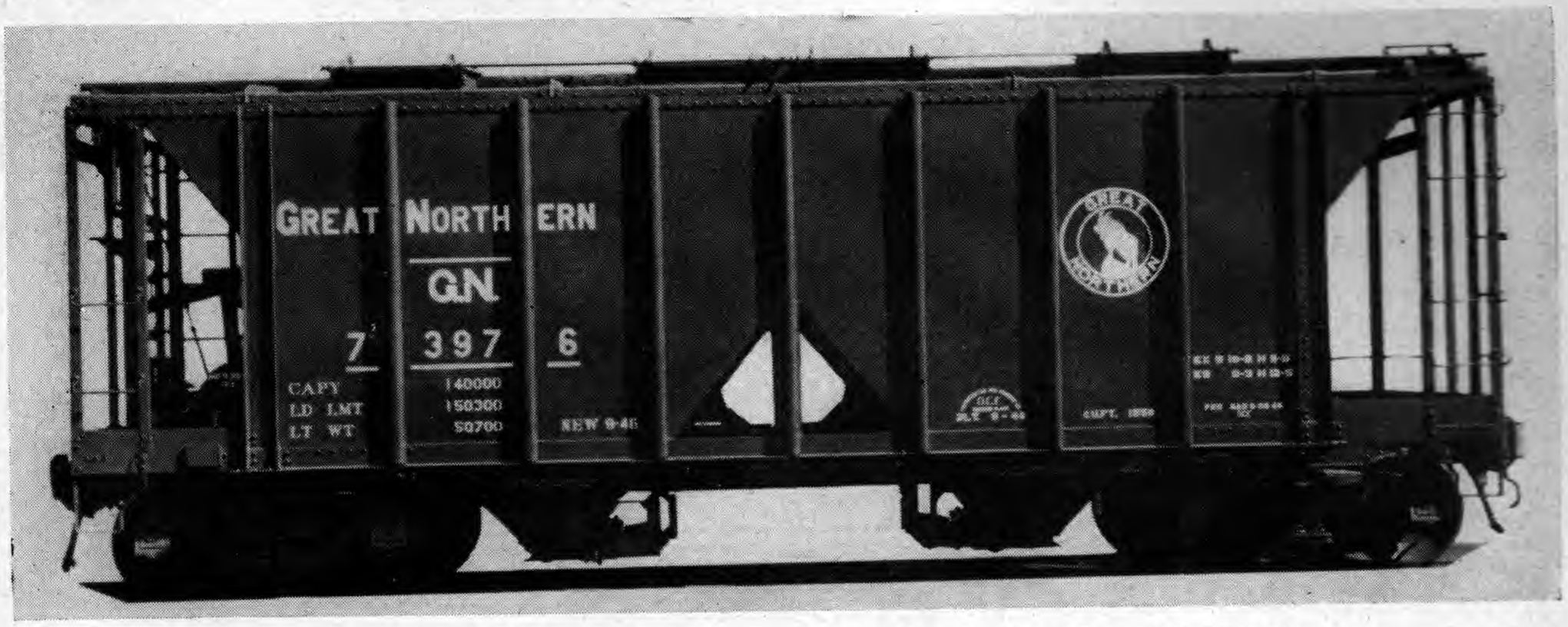
A. A. R. Class	HMA	Length inside	19 ft. 10⅞ in.
Nominal capacity	150,000 lb.	Width inside	10 ft. 5½ in.
Load limit	167,500 lb.	Coupled length	24 ft. 0 in.
Cubic capacity, level	1,262 cu. ft.	Length over strikers	21 ft. 5¼ in.
Light weight	42,500 lb.	Width outside	10 ft. 6 in.
Axle journals	6 in. x 11 in.	Height of sides	10 ft. 2 in.

Great Northern 75-ton hopper iron ore car. Series 90,000-92,999. Builder, Bethlehem Steel Company.



A. A. R. Class	HMA	Axle journals	6 in. x 11 in.
Nominal capacity	140,000 lb.	Length over strikers	21 ft. 6 in.
Load limit	166,100 lb.	Length inside	19 ft. 11 in.
Cubic capacity, level	1,000 cu. ft.	Width inside	10 ft. 5½ in.
Light weight	44,100 lb.	Height of sides	10 ft. 2 in.

Duluth, Missabe & Iron Range 70-ton hopper iron ore car. Road Class U25. Builder, Pressed Steel Car Company, Inc.

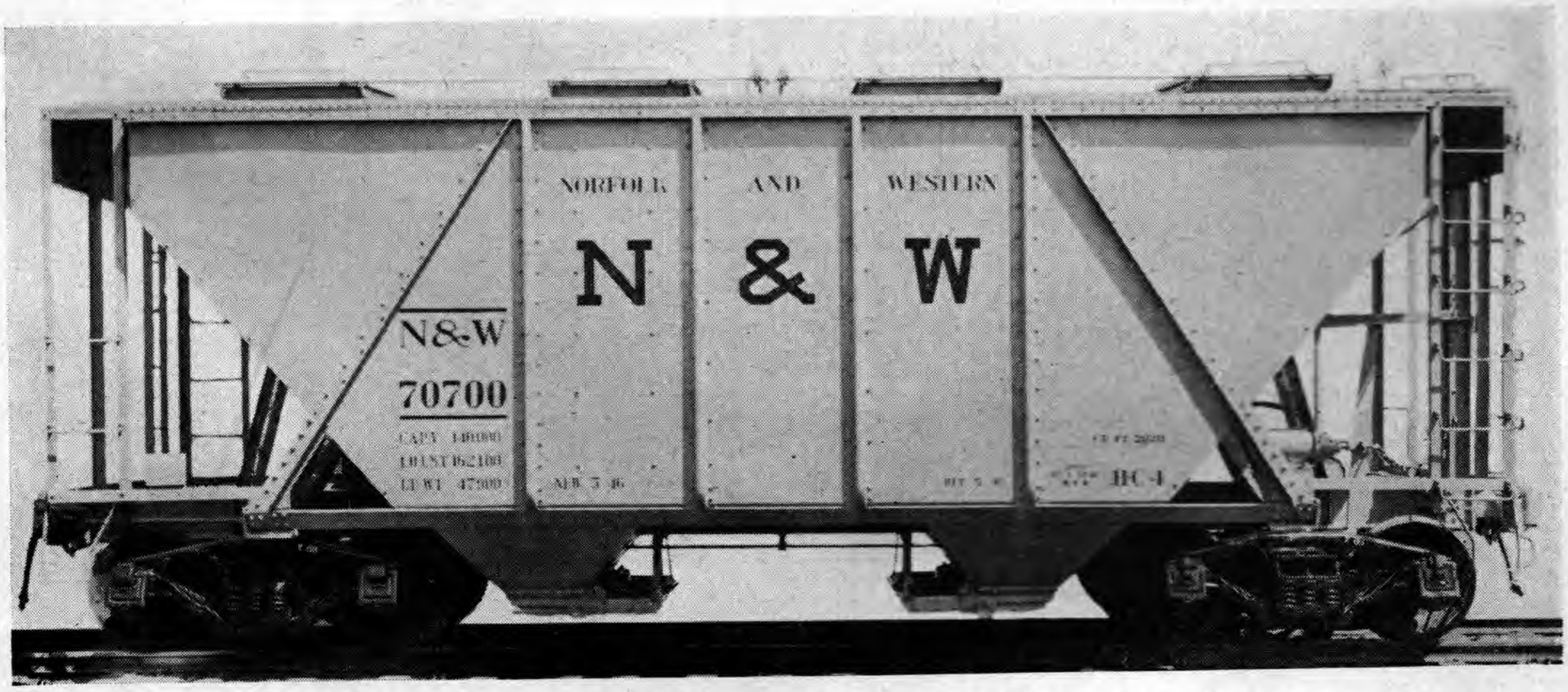


Great Northern 70-ton welded covered hopper car. Builder, American Car and Foundry Co.

Light weight 50,700 lb.; load limit 150,300 lb.; capacity 1,958 cu. ft.; inside length 29 ft. 3 in.; width 9 ft. 5½ in.; 8 hatches 36 in. by 36 in.; 4 hopper openings 13 in. by 24 in.

Chicago Great Western 70-ton welded covered hopper car. Builder, Pullman-Standard Car Manufacturing Co.

Light weight 50,200 lb.; load limit 159,800 lb.; capacity 1,958 cu. ft.; inside length 29 ft. 3 in.; width 9 ft. 5 in.

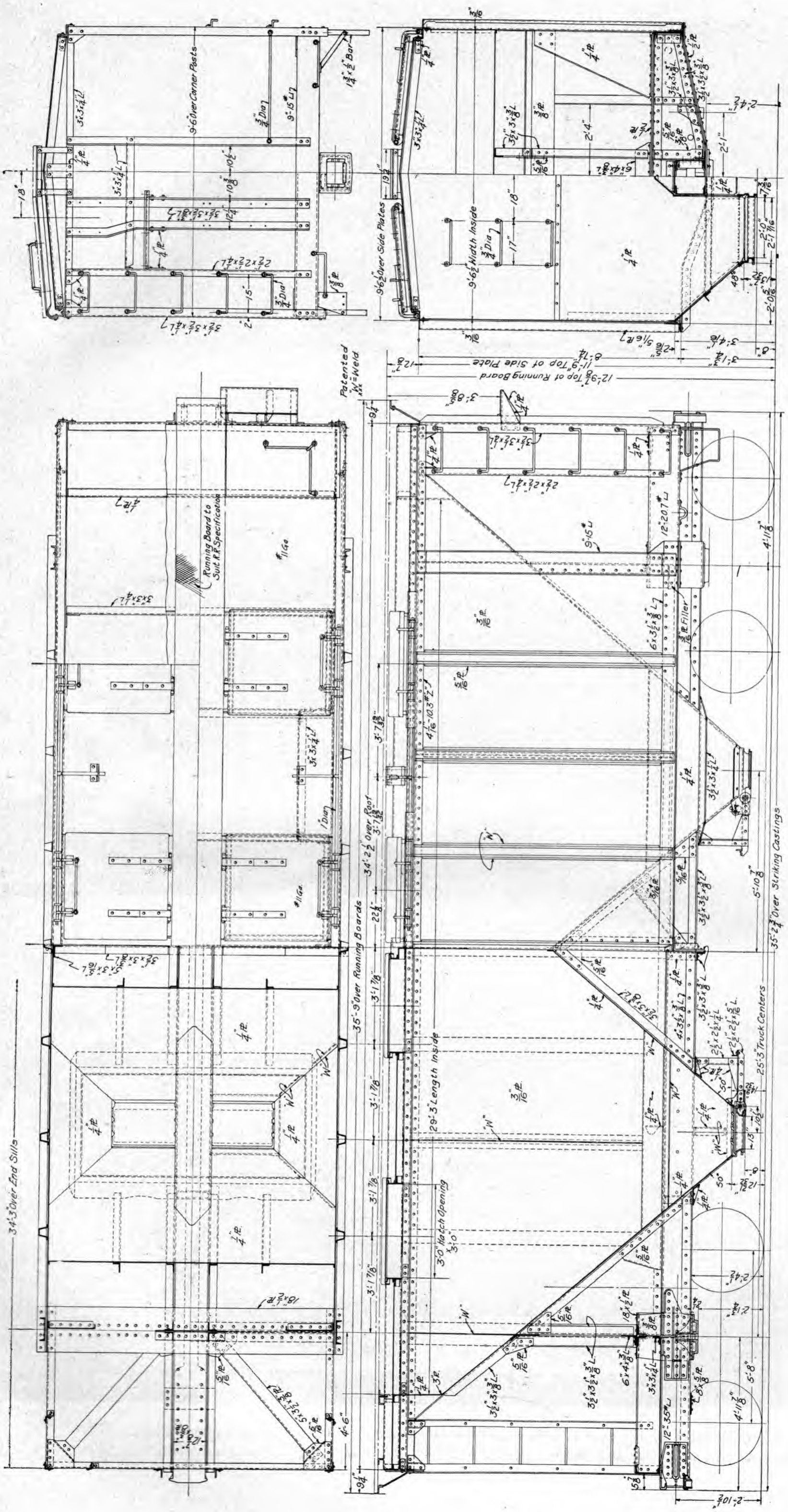


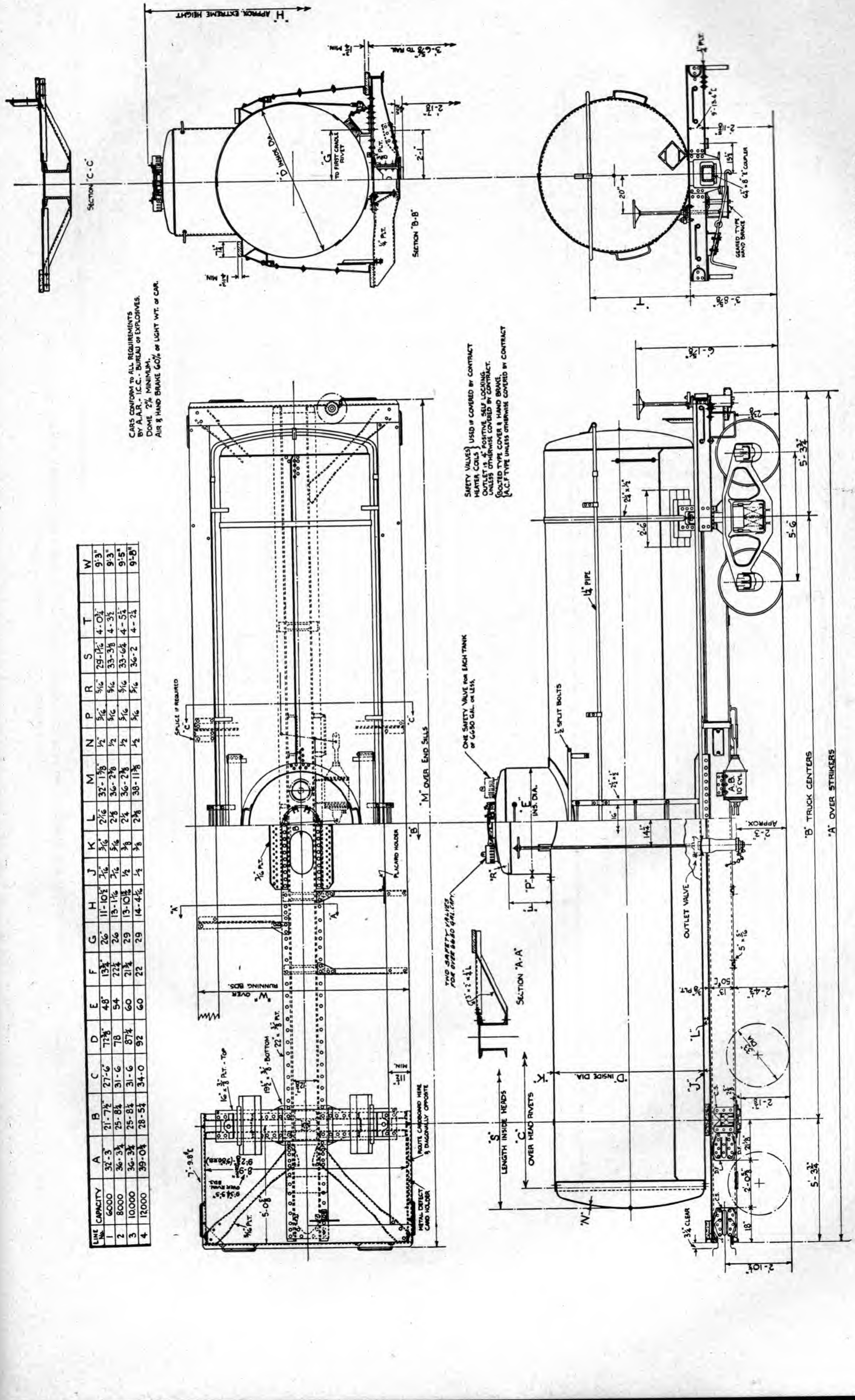
Norfolk & Western 70-ton covered hopper cement car. Road Class HC-4. Built at railroad shops.

Light weight 47,900 lb.; load limit 162,100 lb.; capacity 2,020 cu. ft.; inside length 28 ft. 0 in.; width 9 ft. 10 in.

70-Ton all-steel 6 in. by 11 in. axle load Enterprise bulk commodity covered hopper car. A.A.R. Class LO. Cubic capacity at 11 ft. 6¼ in. height, 1,904 cu. ft. or 2,066 cu. ft. heaped to the peak

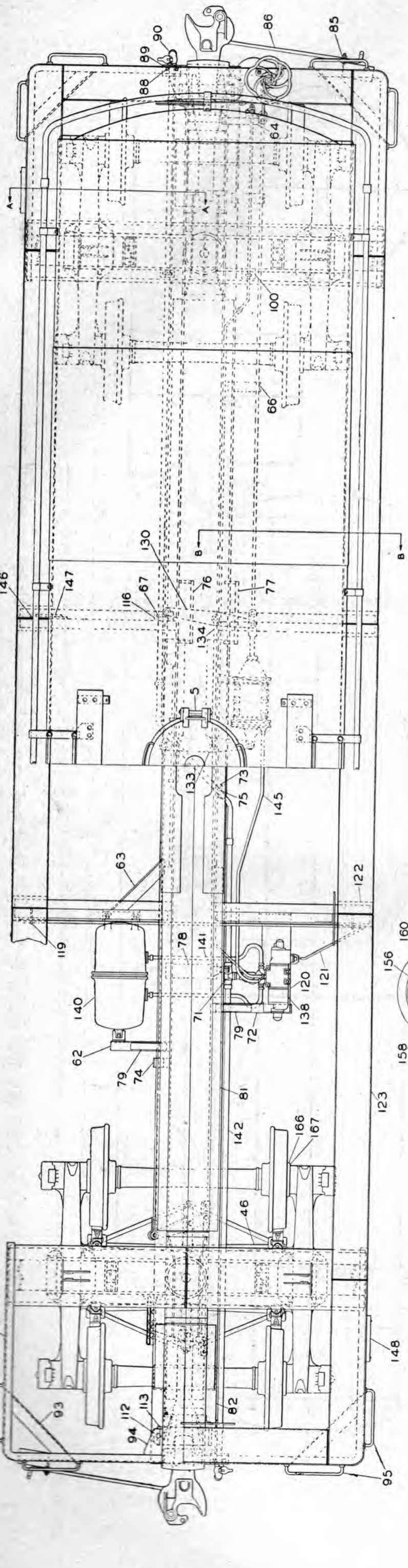
Enterprise Railway Equipment Company

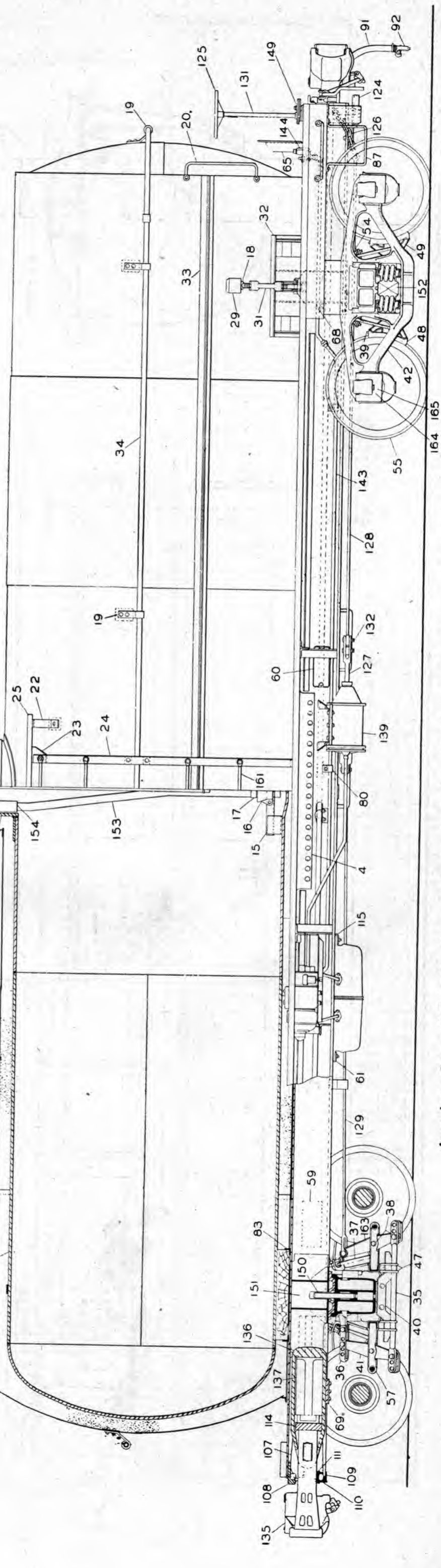




LINE No.	CAPACITY	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	W
1	6000	32'-3"	21'-7½"	27'-6"	72⅜"	48"	13¾"	26"	11'-10½"	5/16"	5/16"	2 1/16"	32'-1⅜"	½"	5/16"	5/16"	29'-1⅞"	4'-0¾"	9'-3"
2	8000	36'-3¾"	25'-8¾"	31'-6"	78"	54"	22¼"	26"	13'-1⅛"	5/16"	5/16"	2⅛"	36'-2⅜"	½"	5/16"	5/16"	33'-3⅜"	4'-3½"	9'-3"
3	10,000	36'-3¾"	25'-8¾"	31'-6"	87¼"	60"	21¾"	29"	13'-10⅛"	½"	⅜"	2¼"	36'-2⅜"	½"	5/16"	5/16"	33'-6¼"	4'-5¼"	9'-5"
4	12,000	39'-0¾"	28'-5¾"	34'-0"	92"	60"	22"	29"	14'-4⅛"	½"	⅜"	2⅜"	38'-11⅜"	½"	5/16"	5/16"	36'-2"	4'-2¼"	9'-8"

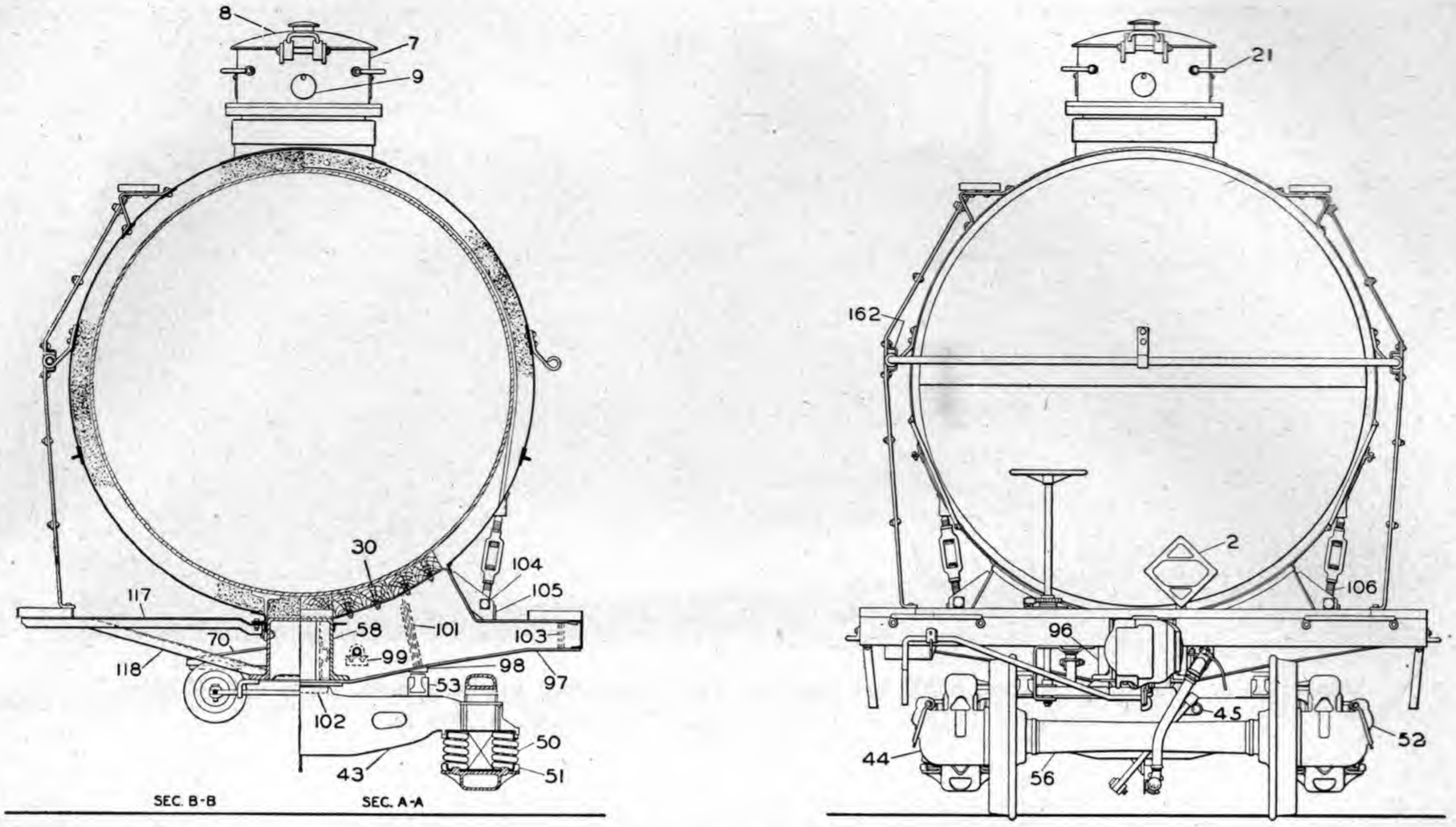
General arrangement of Class ICC-103 (A. C. F. Type 27) steel tank car with riveted underframe for general service. Capacity 6,000 to 12,000 gallons.
American Car and Foundry Company





American Car and Foundry Company's standard class ICC 105 AW tank car with welded underframe.

(See opposite page for names of parts)



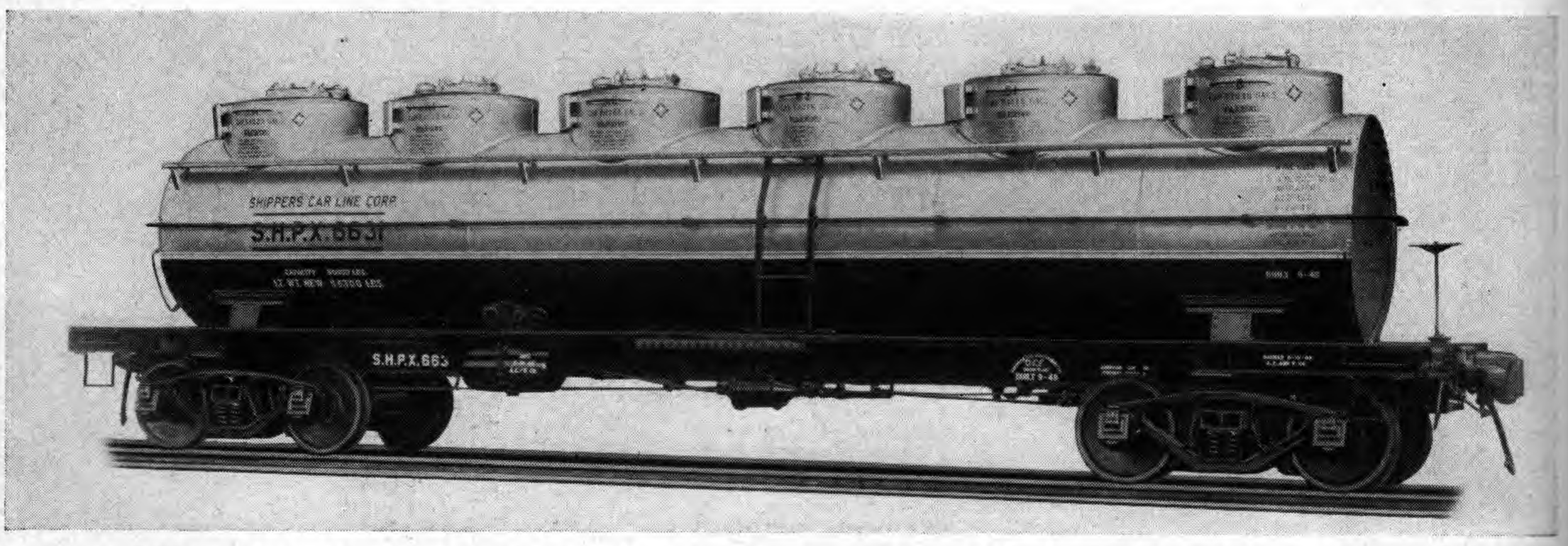
Cross-section of American Car and Foundry Company's Class ICC-105AW Tank Car.

NAMES OF TANK CAR PARTS

1. Tank nozzle
2. Placard holder
3. Dome housing cover hinge and stop
4. Tank anchor
5. Dome housing cover lock pin
6. Dome cover
7. Dome housing
8. Dome housing cover
9. Housing port cover
10. Dome cover hinge
11. Dome cover handle
12. Dome housing cover hinge pin
13. Dome housing stud bolt
14. Safety valve vent and cover
15. Eduction pipe anchor brace
16. Eduction pipe anchor
17. Eduction pipe clamp
18. Tank band
19. Handrail bracket—side and end
20. Tank side grab
21. Dome housing grab
22. Dome platform bracket
23. Ladder and platform connection
24. Ladder stile
25. Dome platform
26. Insulation jacket
27. Tank
28. 4 in. insulation
29. Tank band hood
30. Tank cradle blocking
31. Tank band turnbuckle
32. Insulation jacket reinforcing at cradle blocking
33. Insulation jacket connection angles
34. 1¼ in. st'd. wt. handrail pipe
35. Bottom connection
36. Dead lever fulcrum
37. Brake hanger
38. Brake pin
39. Brake shoe key
40. Brake beam safety angle
41. Dead lever
42. Side frame
43. Bolster—truck
44. Journal box
45. Dead lever fulcrum bracket
46. Brake beam
47. Bottom rod guard
48. Brake shoe
49. Brake head
50. Truck spring
51. Spring plate
52. Journal box lid
53. Side bearing—truck
54. Brake hanger wear plate
55. 33 in. dia. wheel
56. Axle
57. Brake beam strut
58. Center sill
59. Patent plate
60. Brake diagram plate
61. Reservoir support
62. Reservoir support
63. Reservoir support brace
64. Retainer valve support
65. Placard holder support
66. Hand brake rod carrier
67. Trainline U bolt
68. Retainer pipe J bolt
69. Draft gear carrier
70. Cylinder support
71. Branch pipe tee anchor
72. AB valve support brace
73. Trainline support on center sill
74. Top connection carrier
75. Trainline U-bolt on center sill
76. Lever guide
77. Lever guide
78. Center sill bottom tie
79. AB valve support and reservoir support brace
80. Retainer pipe clamp on center sill
81. Ins. jacket connection angle—center
82. Ins. jacket connection angle—end
83. Cradle block retainer
84. Side and end sill
85. Uncoupling rod bracket
86. Uncoupling rod
87. Sill step
88. Angle cock U-bolt
89. Angle cock bracket
90. Angle cock
91. Air brake hose
92. Air brake hose connection
93. Side and end sill brace
94. End and center sill gusset—top
95. Grab iron—side and sill
96. End and center sill gusset—bottom
97. Bolster—body
98. Side bearing—body
99. Trainline support on bolster
100. Retainer pipe support on bolster
101. Side bearing brace
102. Center plate—body
103. Bolster end reinforcing plate
104. Tank band bolt anchor
105. Tank band bolt anchor brace
106. Tank band bolt
107. Front draft lug
108. Striker
109. Tie strap on center sill at striker
110. Coupler carrier
111. Coupler wear plate
112. Coupler yoke key
113. Coupler key retainer
114. Follower
115. Reservoir suppt. at runn. bd. suppt.
116. Trainline suppt. on runn. bd. suppt.
117. Runn. bd. suppt.—top angle
118. Runn. bd. suppt.—bottom angle
119. Release rod bracket
120. AB valve support
121. Release rod
122. Runn. bd. splice plate
123. A.A.R. approved steel running boards
124. A.A.R. certified geared hand brake unit
125. Hand brake wheel
126. Hand brake chain
127. Push rod
128. Hand brake rod
129. Top connection
130. Cylinder lever
131. Brake mast
132. Brake pin
133. Floating lever
134. Center connection
135. A.A.R. type E coupler
136. Coupler yoke
137. A.A.R. approved draft gear
138. AB valve
139. Brake cylinder
140. Air brake reservoir
141. ¾ in. E. S. reservoir pipe
142. 1¼ in. E. S. trainline pipe
143. ⅜ in. E. S. retaining pipe
144. Retaining valve
145. ¾ in. E. S. brake cylinder pipe
146. Defect card holder bracket
147. Defect card holder
148. Route card board
149. Hand brake ratchet and pawl plate
150. Center pin
151. Combined center filler and rear draft lug
152. Friction truck spring
153. Eduction pipe
154. Excess flow check valve
155. Gauging device
156. Vent angle valve
157. Eduction angle valve
158. Safety valve
159. Thermometer well
160. Test tube
161. Ladder rung
162. Ladder and handrail bracket
163. Live lever
164. Journal bearing
165. Journal bearing wedge
166. Dust guard
167. Dust guard cover

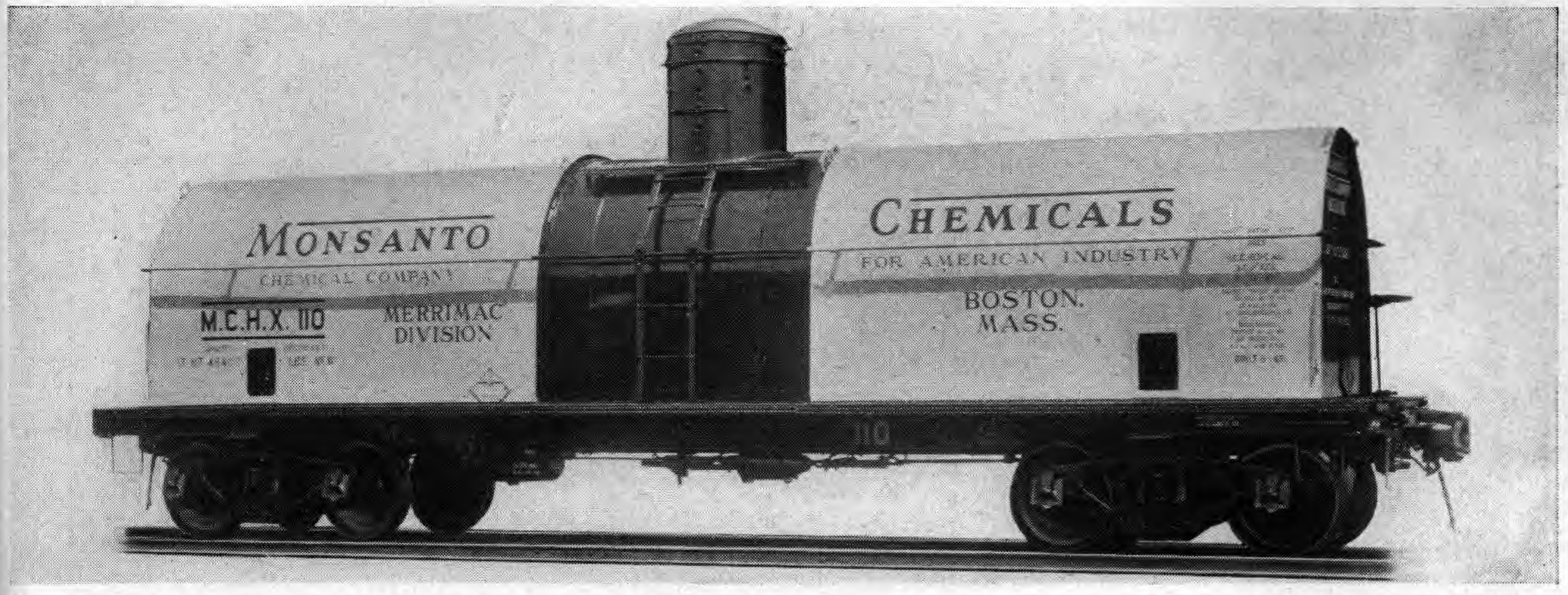
Shippers' Car Line Corp. 70-ton, 8,000 gal. tank car for transporting sulphuric acid. Class ICC-103AW.
Capacity 140,000 lb. or 8,000 gal.; light weight 49,900 lb.

Pennsylvania Salt Manufacturing Co. of Washington 70-ton, 10,657 gal. W.C. tank car for transporting liquid chlorine. Class ICC-105A300W.
Capacity, 110,000 lb. or 10,657 gal.; light weight, 83,100 lb.



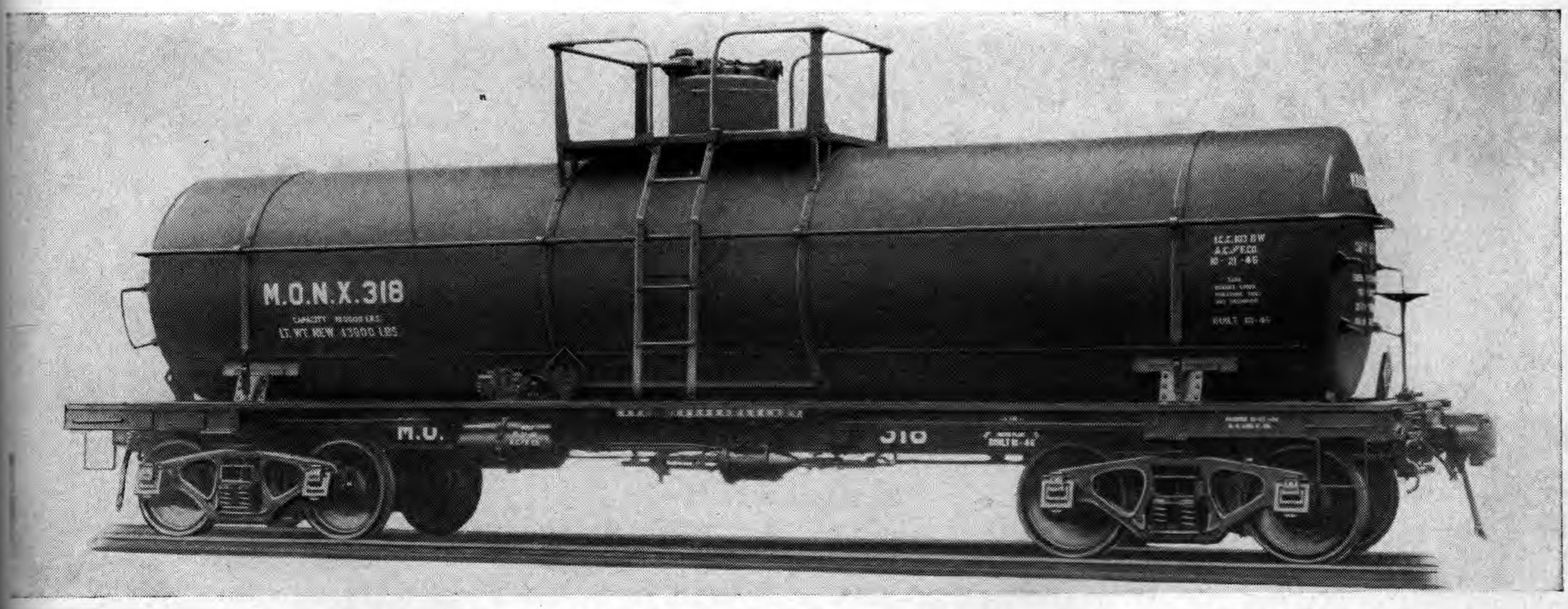
Shippers' Car Line Corp. 40-ton, 6,000-gal., six-compartment insulated tank car for transporting wine. Class AAR-203W.
Capacity, 80,000 lb., total or 1,000 gal. in each compartment; light weight, 56,300 lb.

American Car and Foundry Company



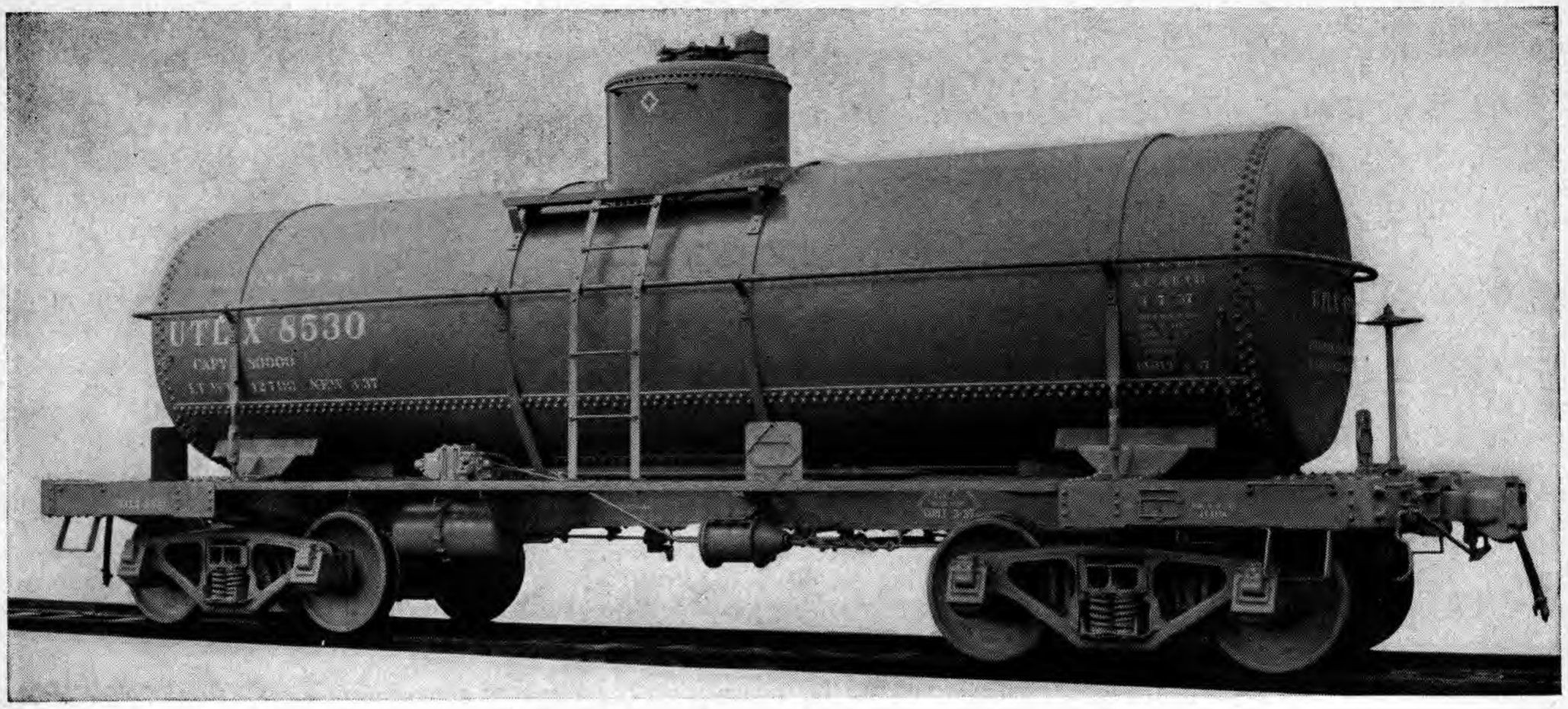
Monsanto Chemical Co. 50-ton, 8,000-gal., aluminum tank car for transporting 95 per cent or greater nitric acid. Class ICC-103C-AL.
Capacity, 100,000 lb. or 8,000 gal.; light weight, 45,400 lb.

Barrett Division, Allied Chemical & Dye Corp. 50-ton, 10,000-gal., tank car, insulated, for transporting tar products. Class ICC-103W.
Capacity, 100,000 lb. or 10,000 gal.; light weight, 53,100 lb.

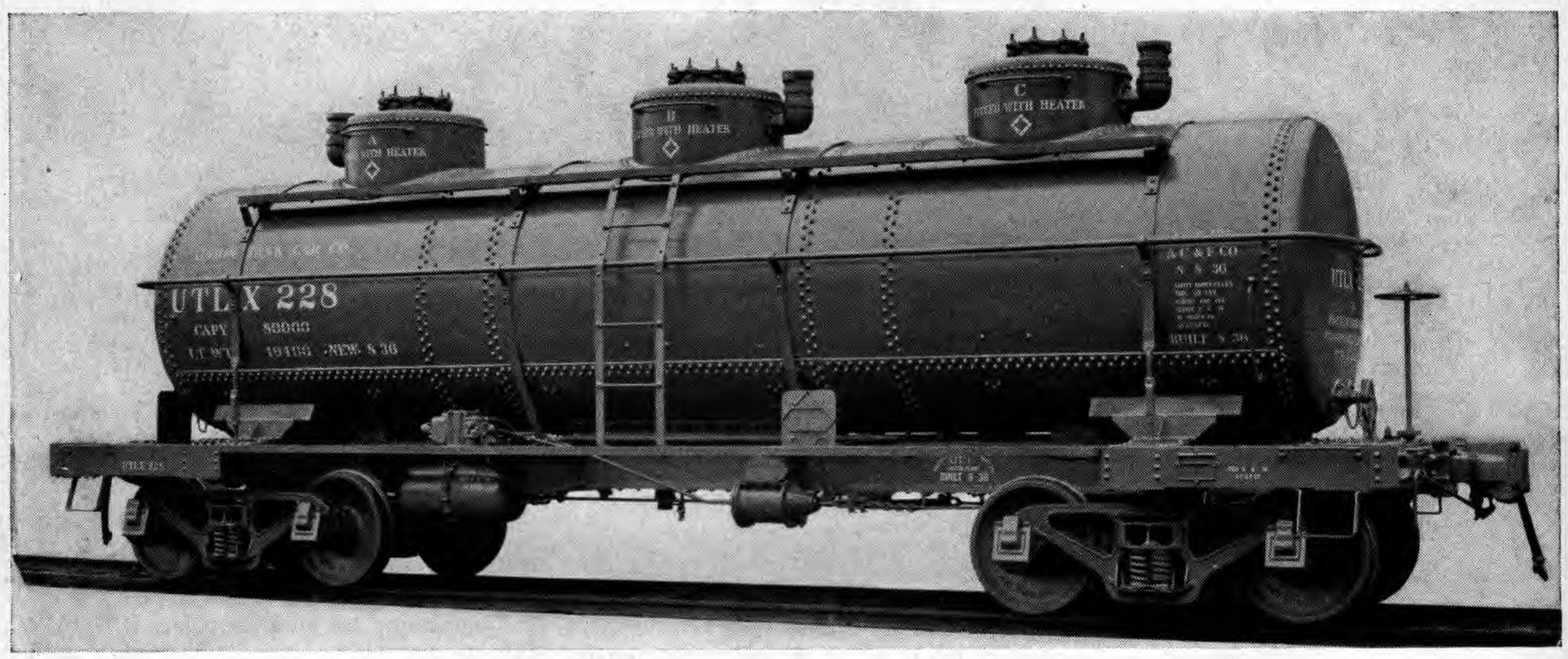


Monsanto Chemical Co. 50-ton, 8,000 gal., rubber- lined, tank car for transporting muriatic acid. Class ICC-103BW.
Capacity 100,000 lb. or 8,000 gal.; light weight 48,000 with lining.

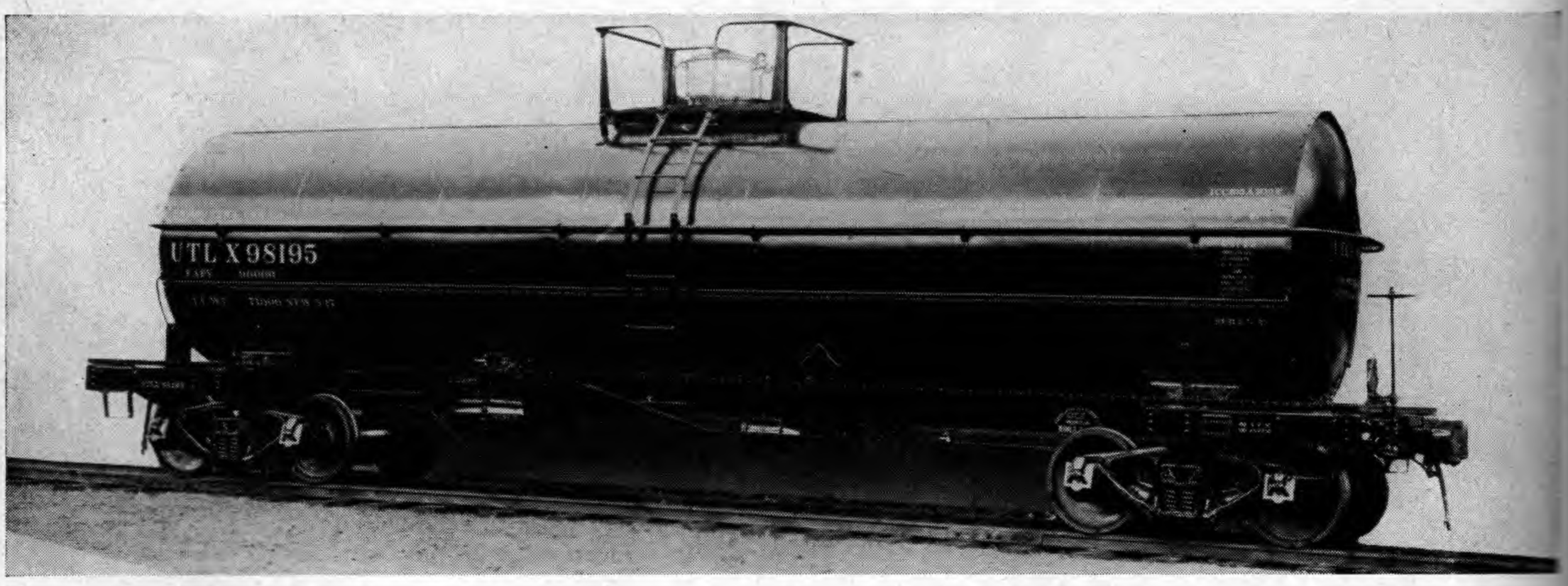
American Car and Foundry Company



Union Tank Car Co. single-compartment tank car for general service. Class ICC-103.
Capacity, 80,000 lb. or 6,500 gal.; light weight, 42,700 lb.



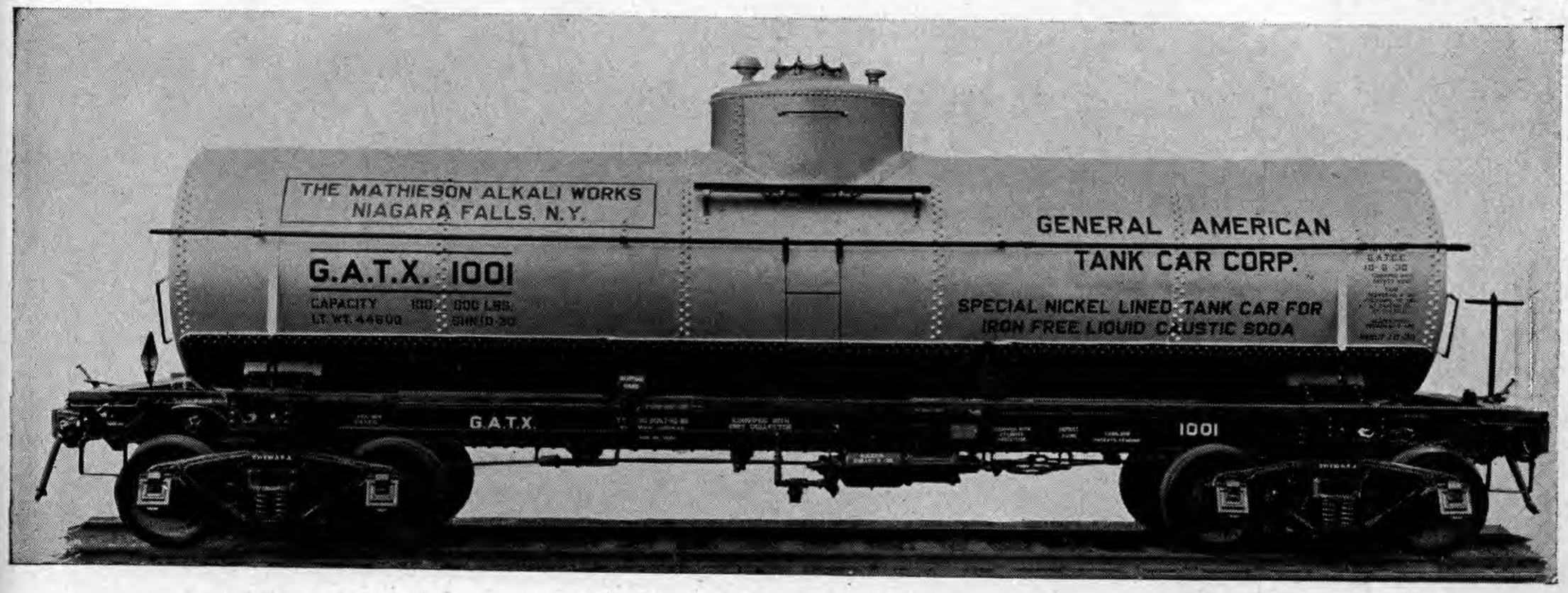
Union Tank Car Co. three-compartment tank car for general service. Class ICC-103.
Capacity, 80,000 lb. or 6,600 gal. (2,200 gal. in each compartment); light weight, 49,400 lb.



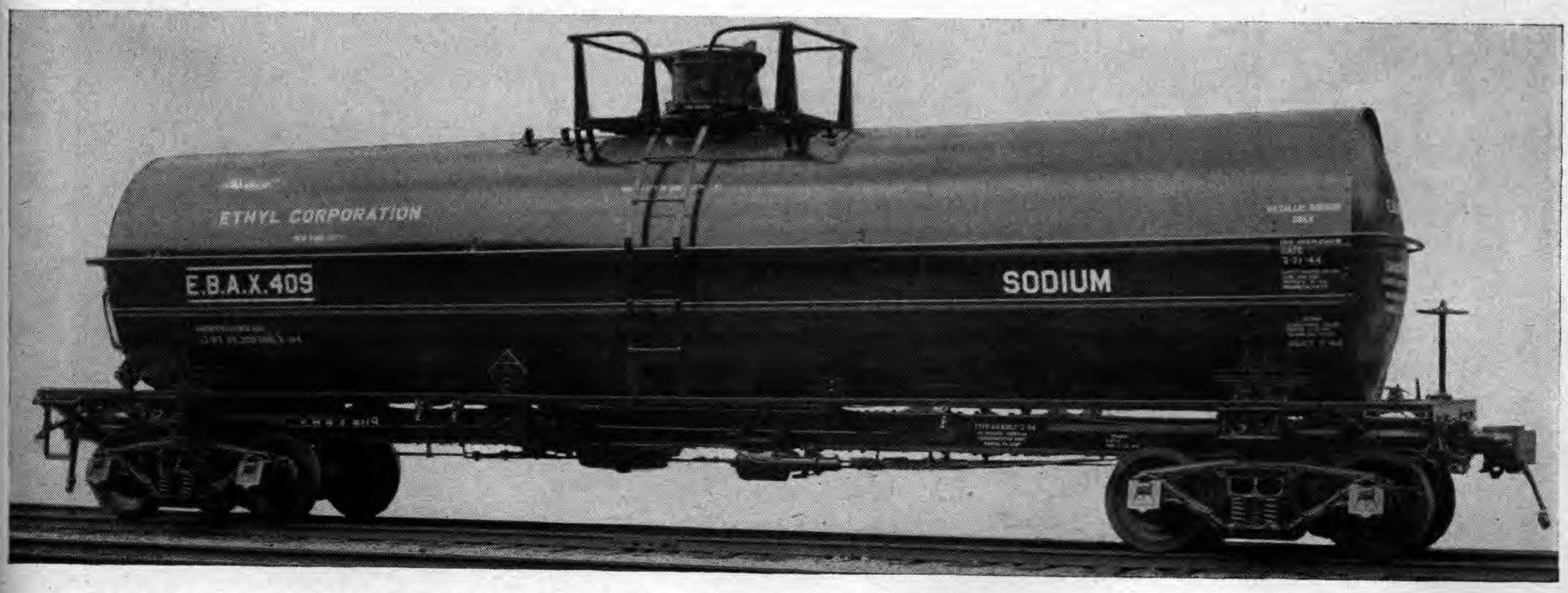
Union Tank Car Co. insulated and jacketed tank car with fusion-welded tank for transporting liquefied petroleum gases having pressure not over 225 lb. at 105 deg. F. Class ICC-105A300W.
Capacity, 11,000 gal. (water capacity, 92,222 lb.); light weight, 71,000 lb.

Union Tank Car Company

Shippers' Car Line Corp. 50-ton, 7,300 gal., chrome iron tank car for transporting nitric acid. Class ICC-103CW. Light weight 43,200 lb. Builder, American Car and Foundry Company.

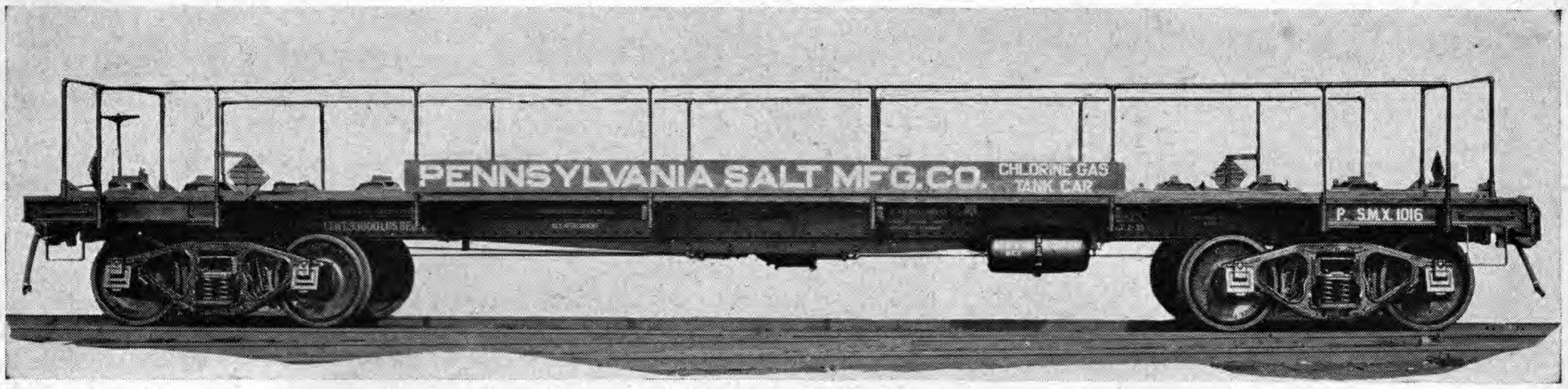


Nickel-lined tank car for transporting iron-free liquid caustic soda and other chemicals which attack steel cars. Weight, 44,600 lb., capacity, 100,000 lb. Builder, General American Transportation Corporation.

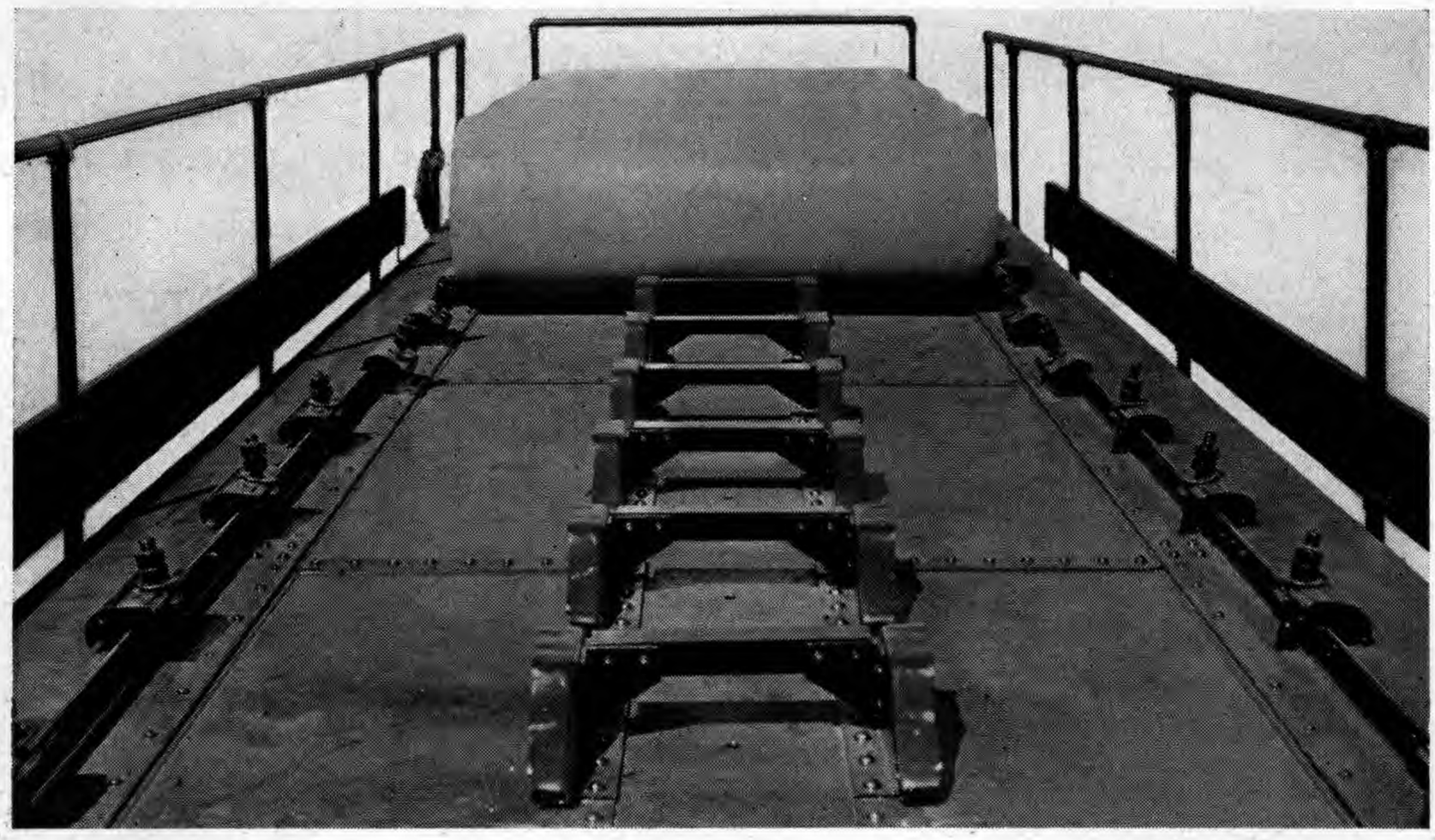


Ethyl Corporation tank car, Class ICC 105A300W. Welded steel tank heavily insulated. Used for transportation of metallic sodium. No bottom outlet valve. Builder, General American Transportation Corporation.

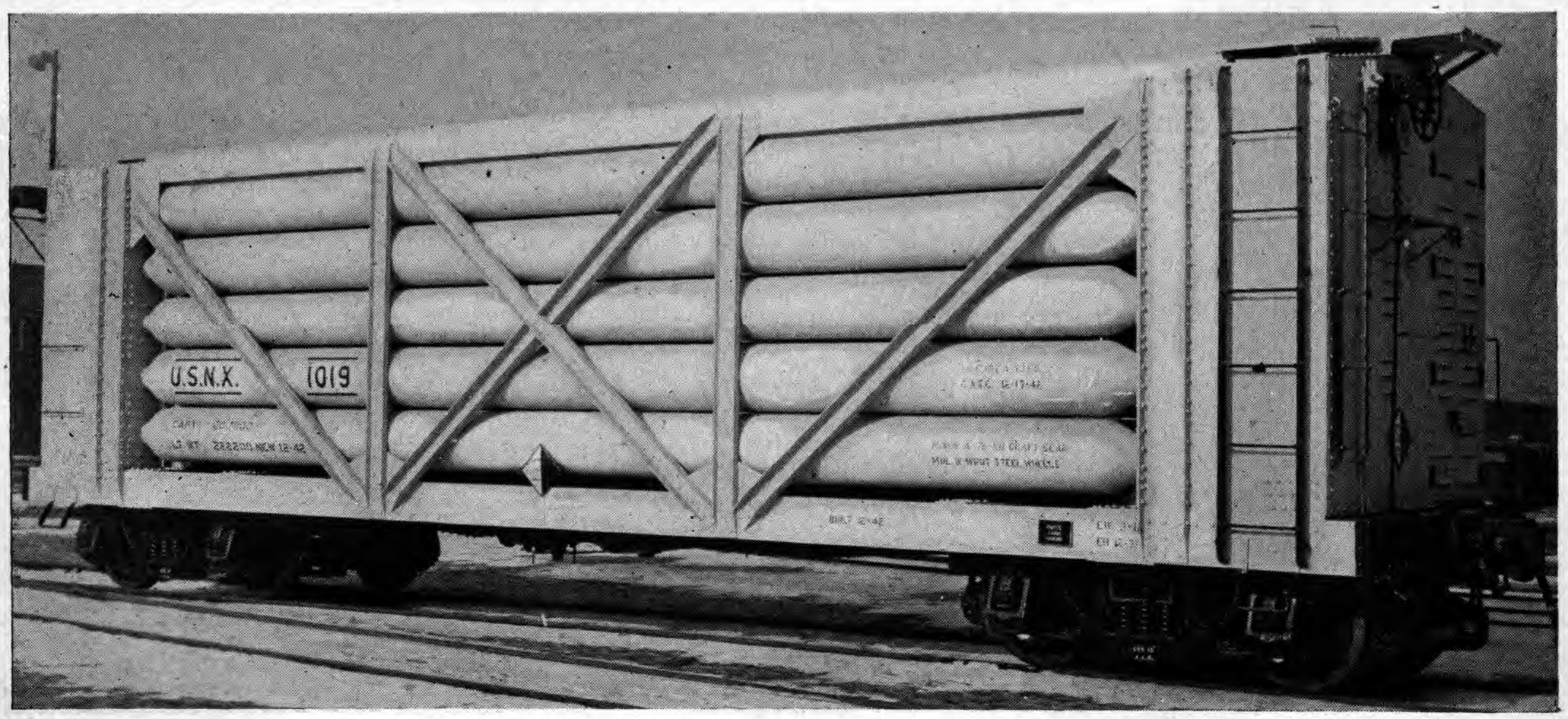
Capacity 11,000 gal. or 140,000 lb.; weight 95,200 lb.



Multi-unit tank car for liquid chlorine, AAR Class TMU. Builder, American Car and Foundry Company.
Capacity, 80,000 lb.; light weight, 33,800 lb.
(*See also illustration below*)

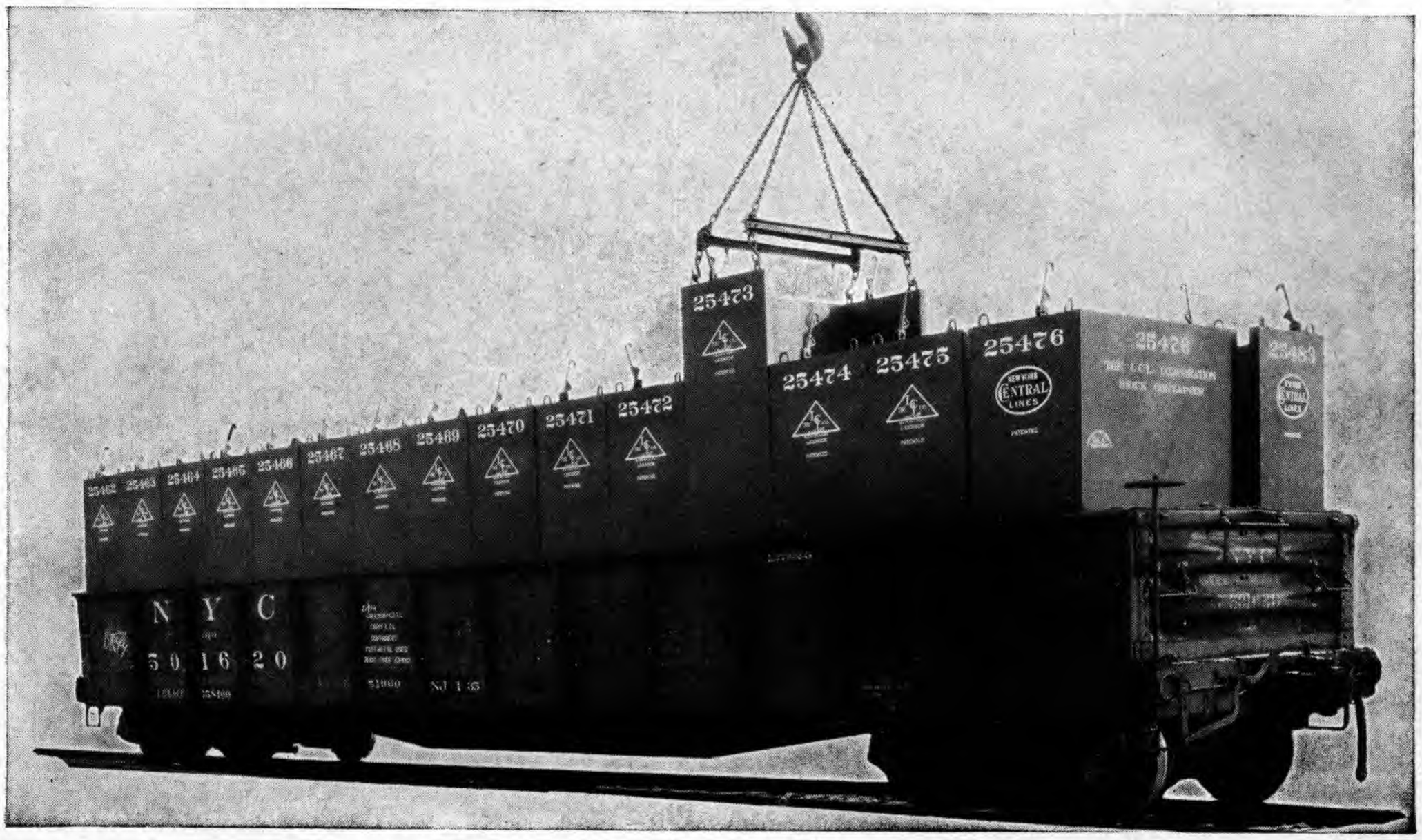


Partly loaded multi-unit tank car for shipment of liquid chlorine. Builder, American Car and Foundry Co.
(*For unloaded car see illustration above*)

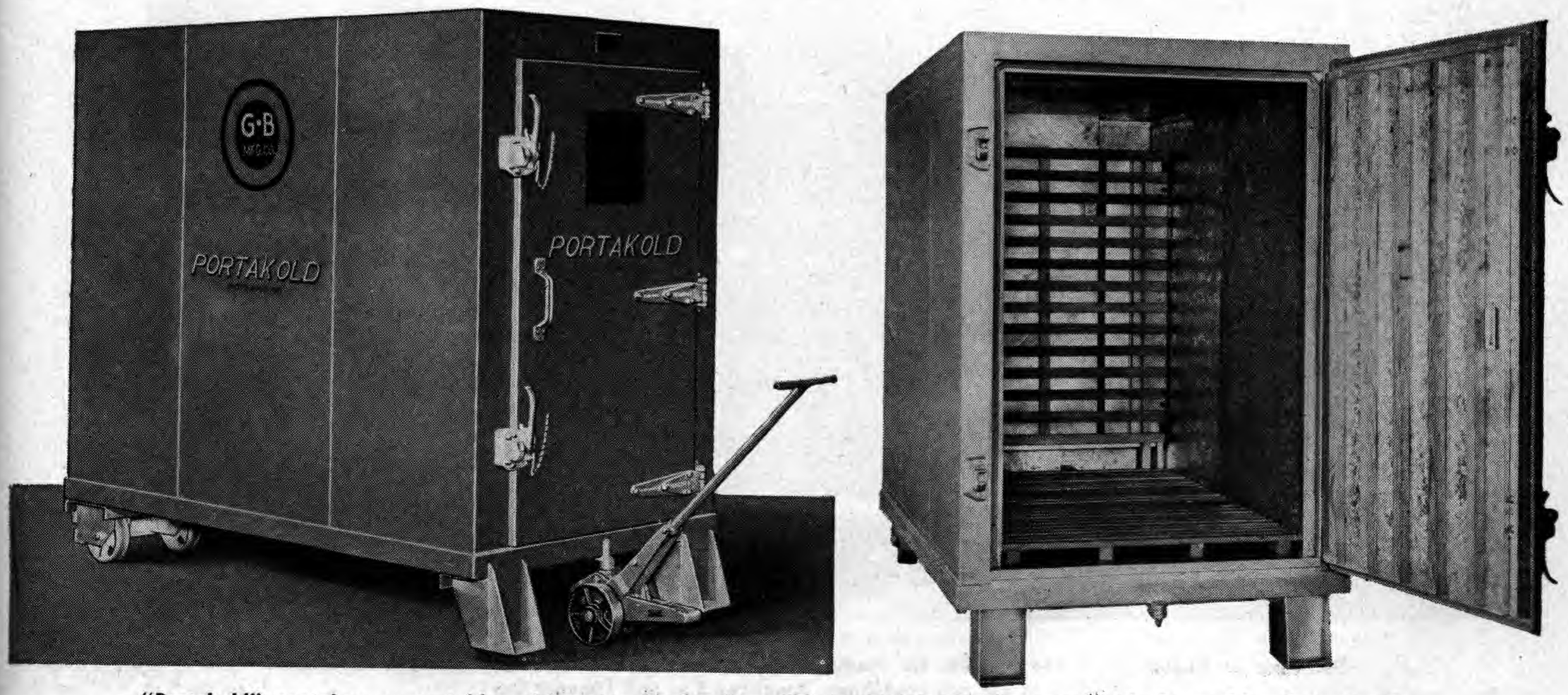


United States Navy, Bureau of Aeronautics, helium tank car holding 28 seamless-tube containers. ICC-107A.
Designed and built by General American Transportation Corp.
Outside diameter, 18½ in., length 37 ft.; total capacity, 200,000 cu. ft. of helium gas at normal temperature and pressure. **Light weight, 222,200 lb.**

New York Central 70-ton container gondola car loaded with 12 LCL lime-cement containers.

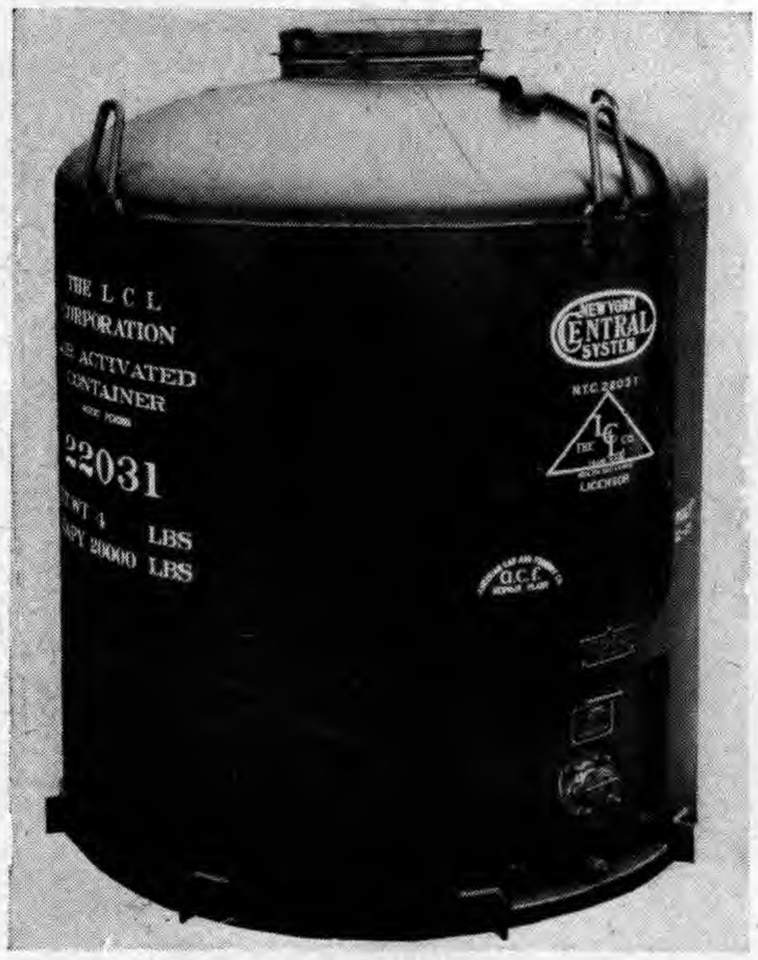


New York Central container gondola car loaded with 22 LCL stacked brick containers.

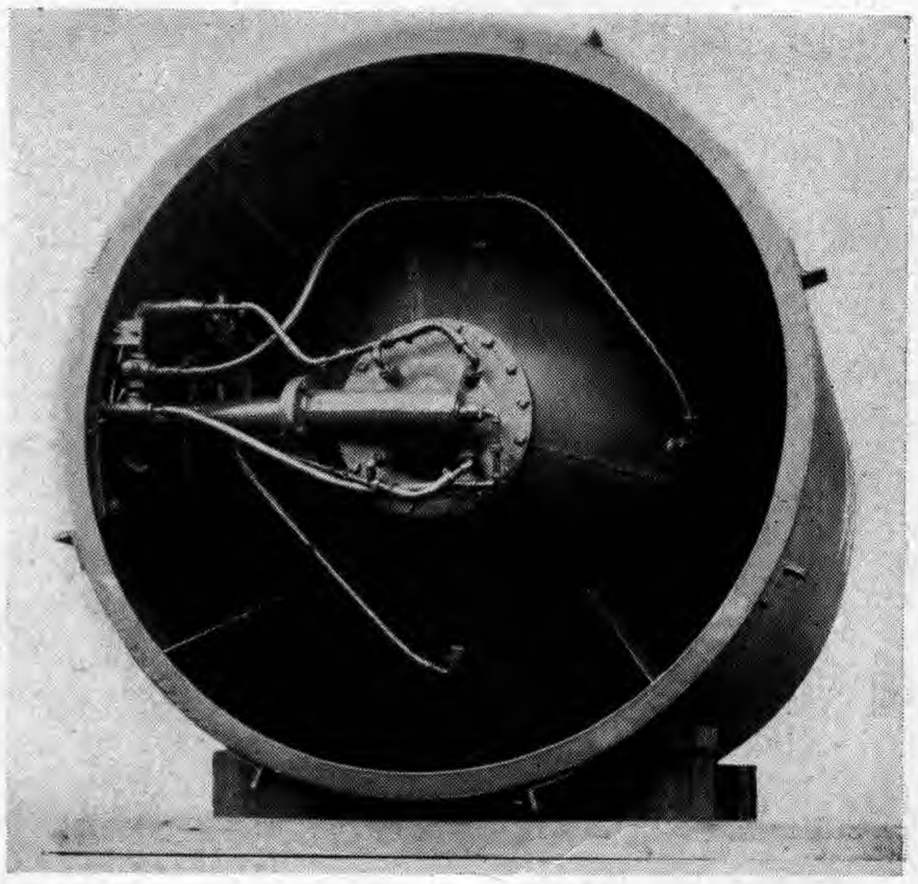


"Portakold" container or portable refrigerator for handling LCL perishables in box cars. Gustin-Bacon Manufacturing Co.

New York Central container gondola car loaded with six LCL air-activated bulk-cement containers.
Containers, each, light weight, 4,385 lb.; capacity, 20,000 lb.; diameter, 7 ft. 6 in.

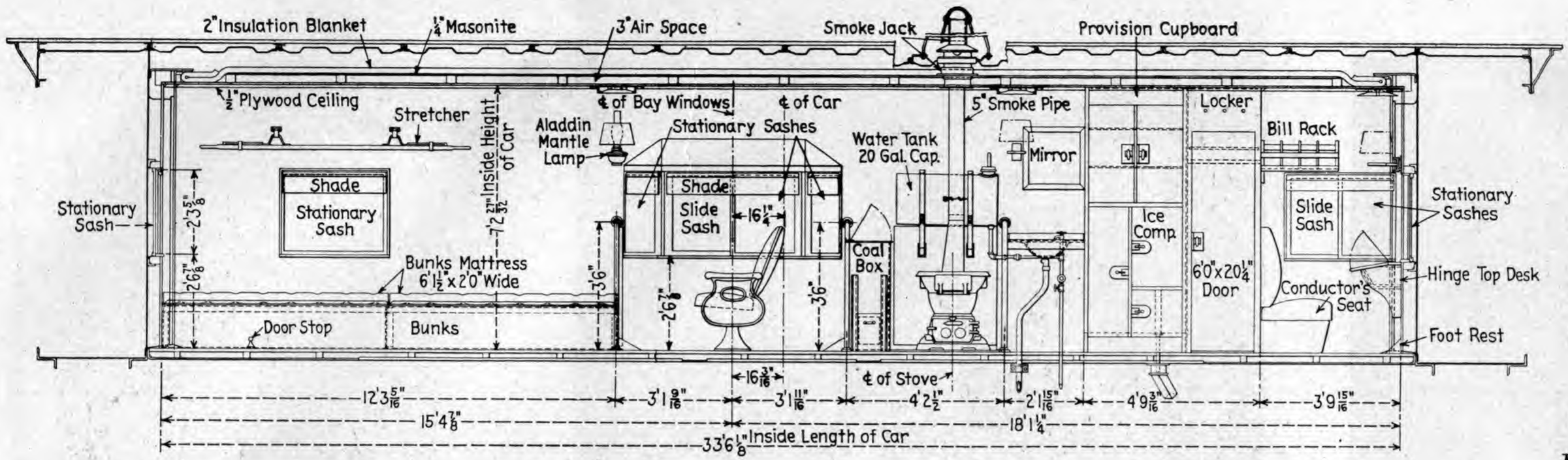


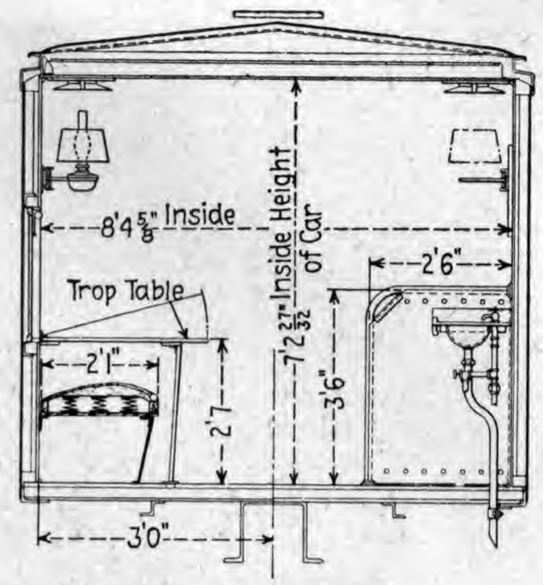
LCL air-activated bulk-cement container.

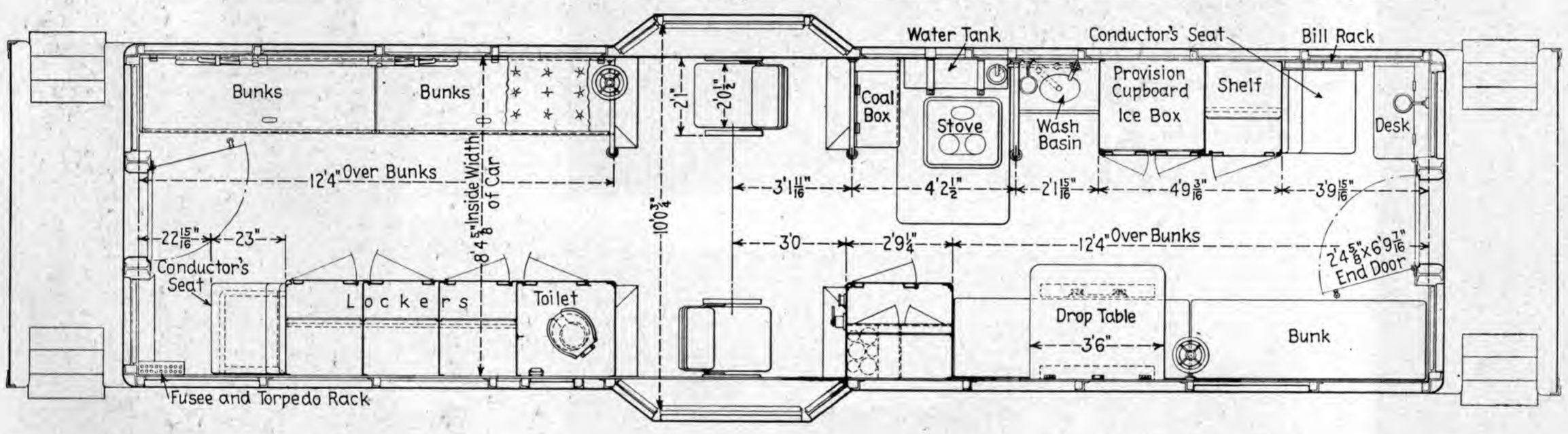


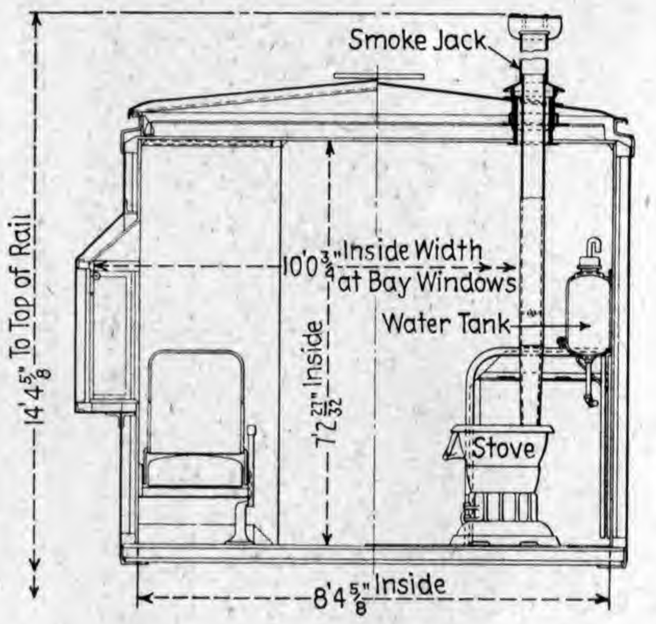
Bottom view of LCL bulk-cement container showing air pipes and unloading connection.
(*Capacity either* 20,000 *or* 22,000 *lb.*)

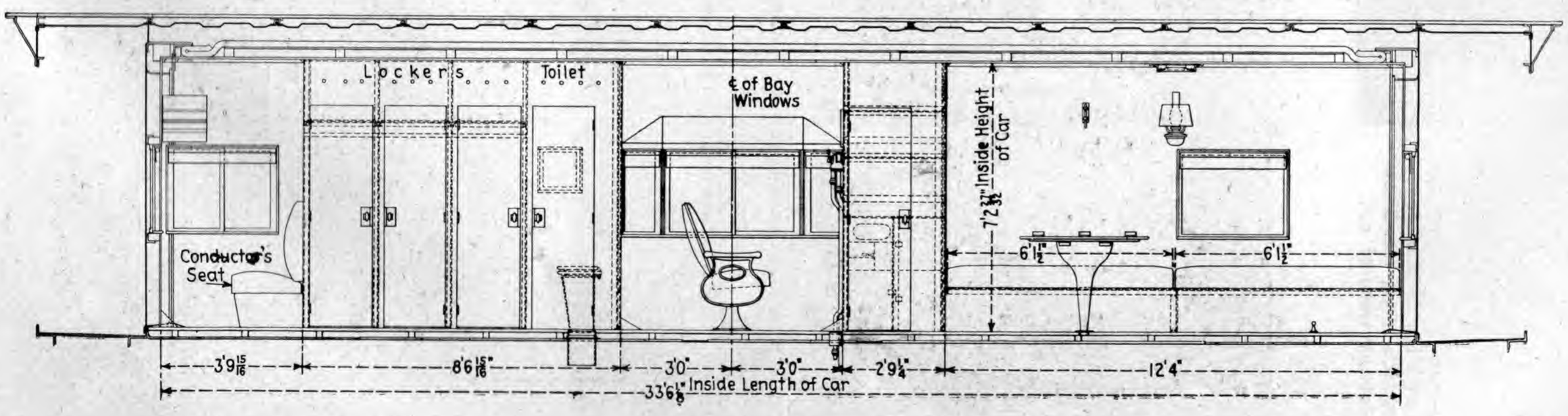
Delaware & Hudson container gondola car loaded with five LCL air-activated bulk-cement containers.
Builder of car and containers, American Car and Foundry Co.
Car, inside length 46 ft. 3 in.; light weight 52,700 lb.; load limit 157,300 lb.; containers, each, capacity 22,000 lb.; light weight 4,430 lb.







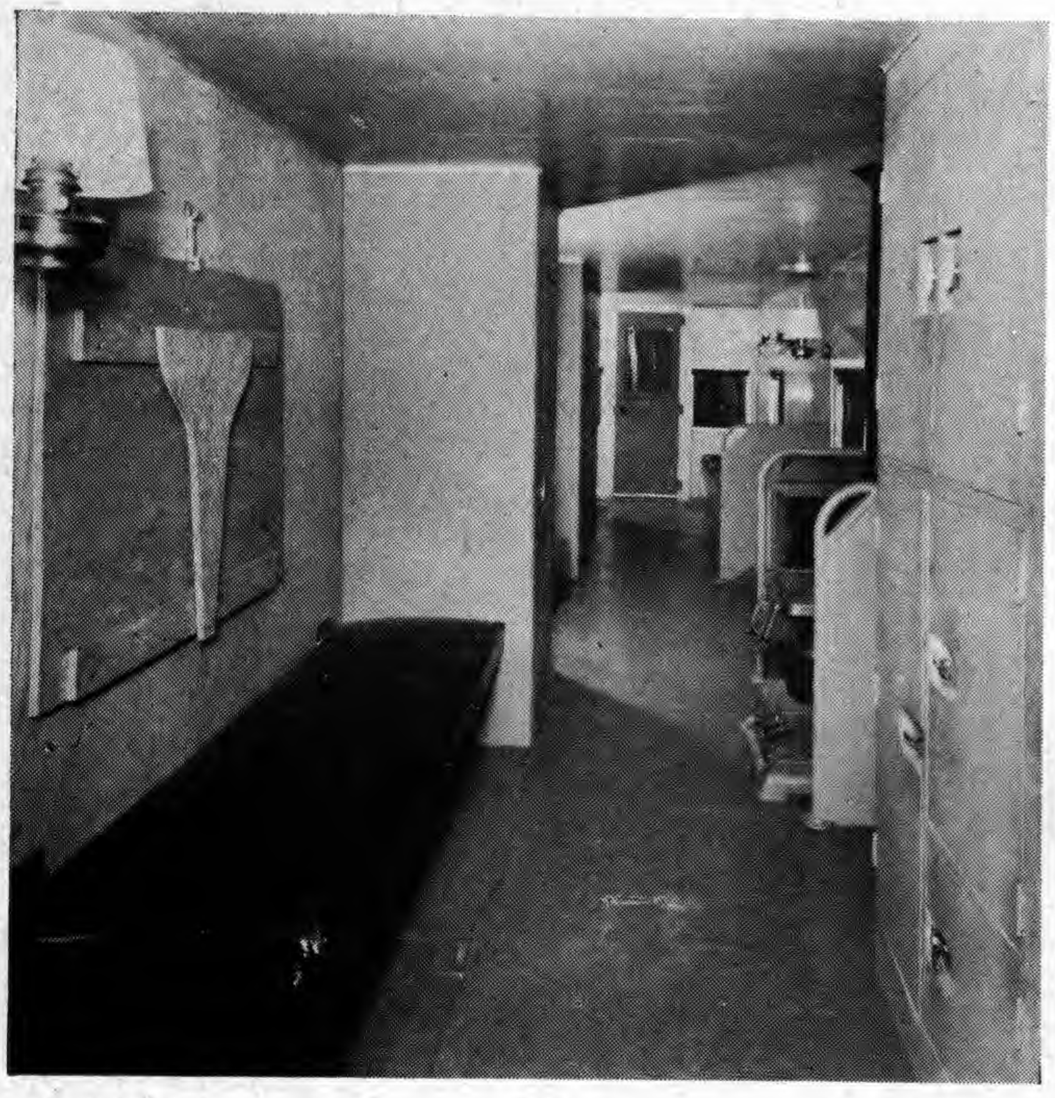


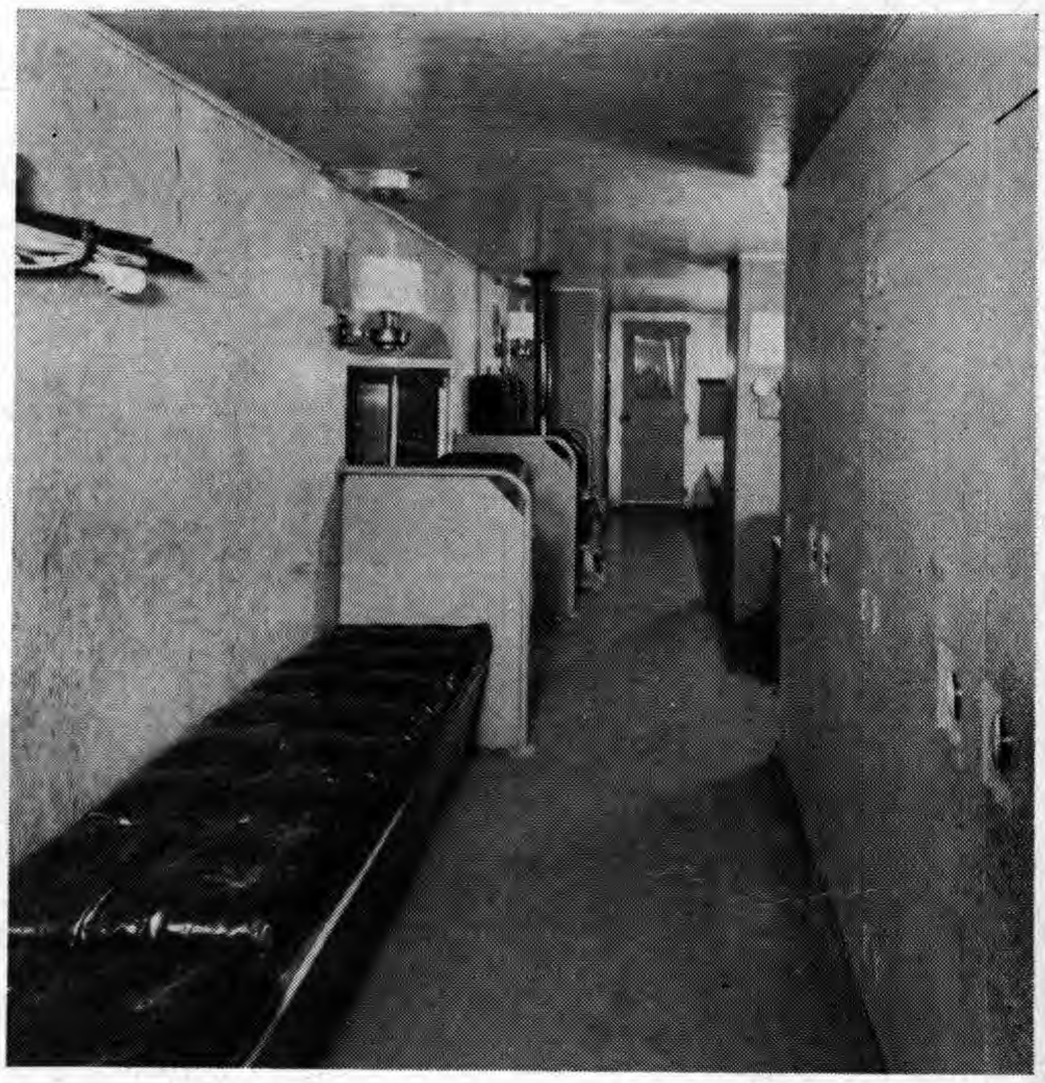


Interior arrangement of New York Central steel caboose car with bay window.

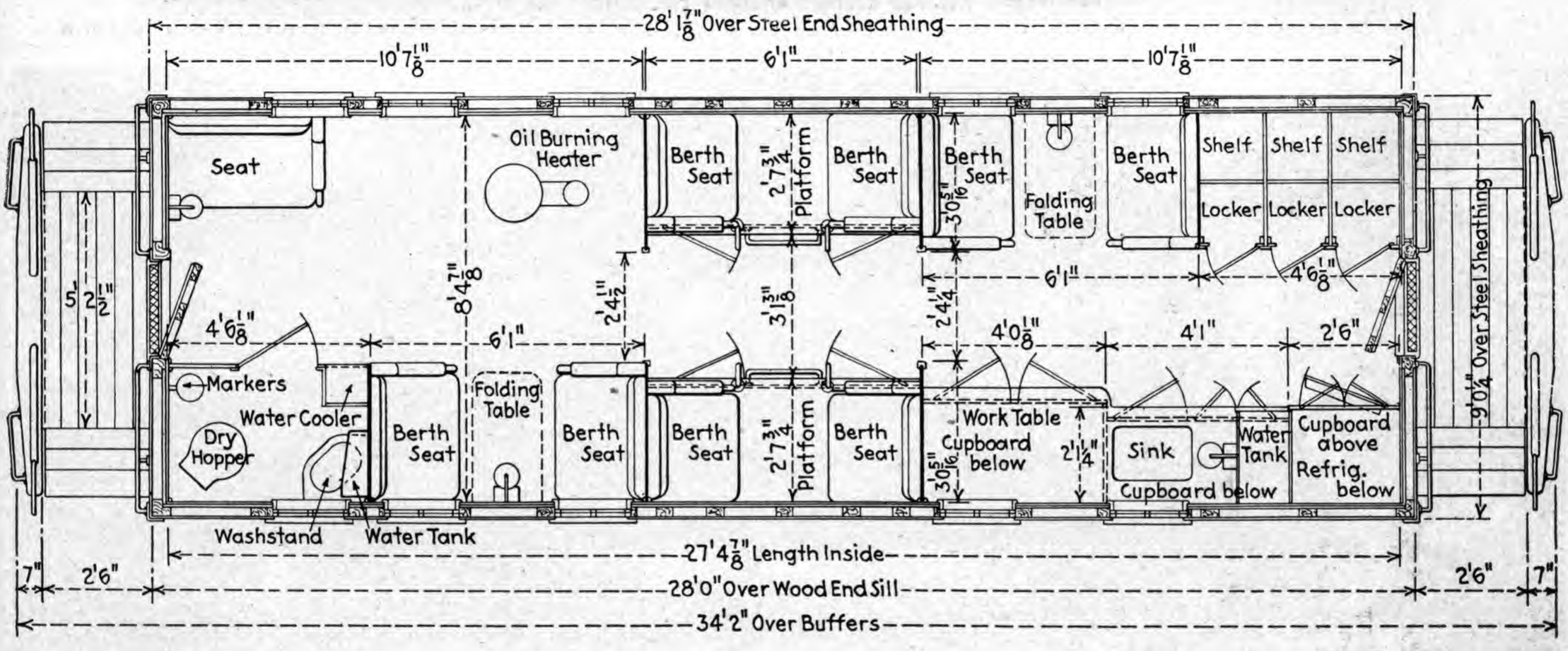
(*See also opposite page*)

Right—New York Central caboose with bay window. Builder, Despatch Shops, Inc. Below —Interior views of car.

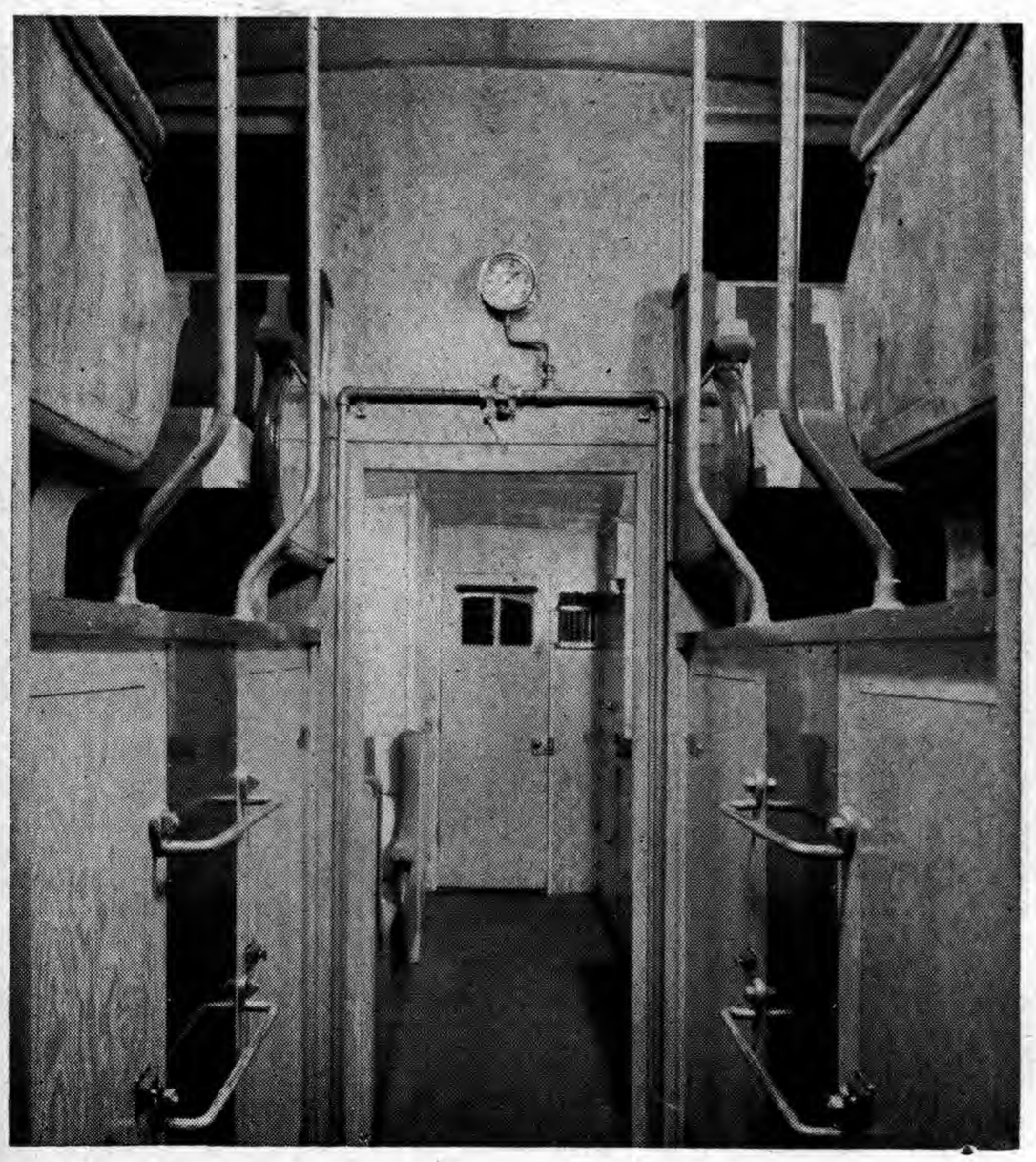


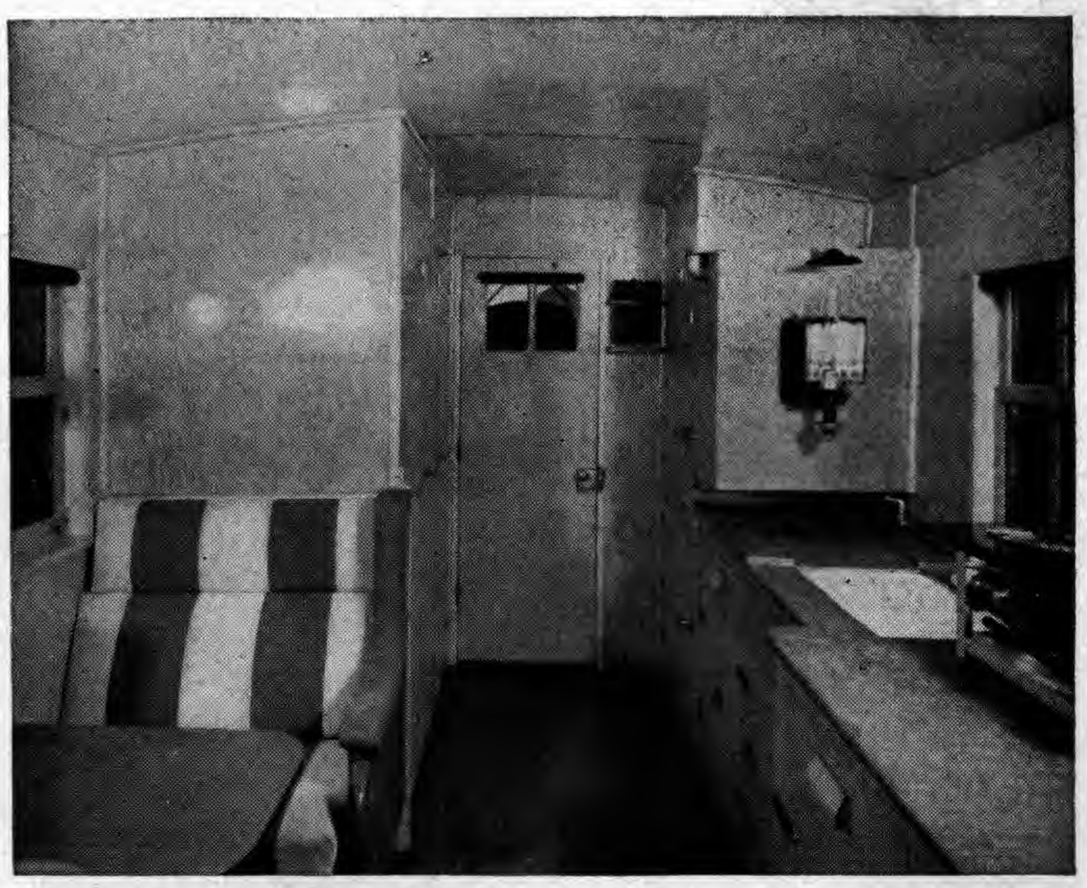


New Haven caboose. Builder, International Railway Car & Equipment Co.



Chicago & Illinois Midland rebuilt caboose car. Plan shows unusual facilities for crew comfort.



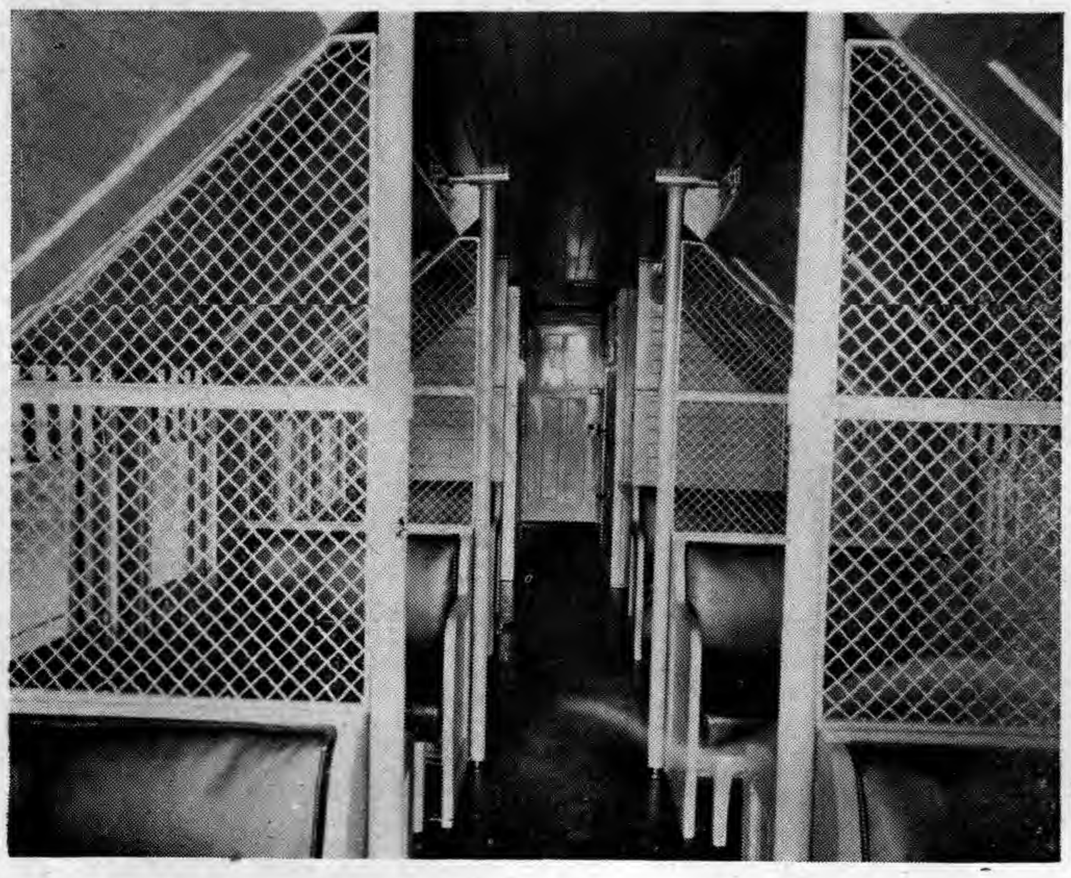


Above—Kitchen facilities include refrigerator, sink, cupboards, work table and oil stove.

Left—From cupola looking toward kitchen end.

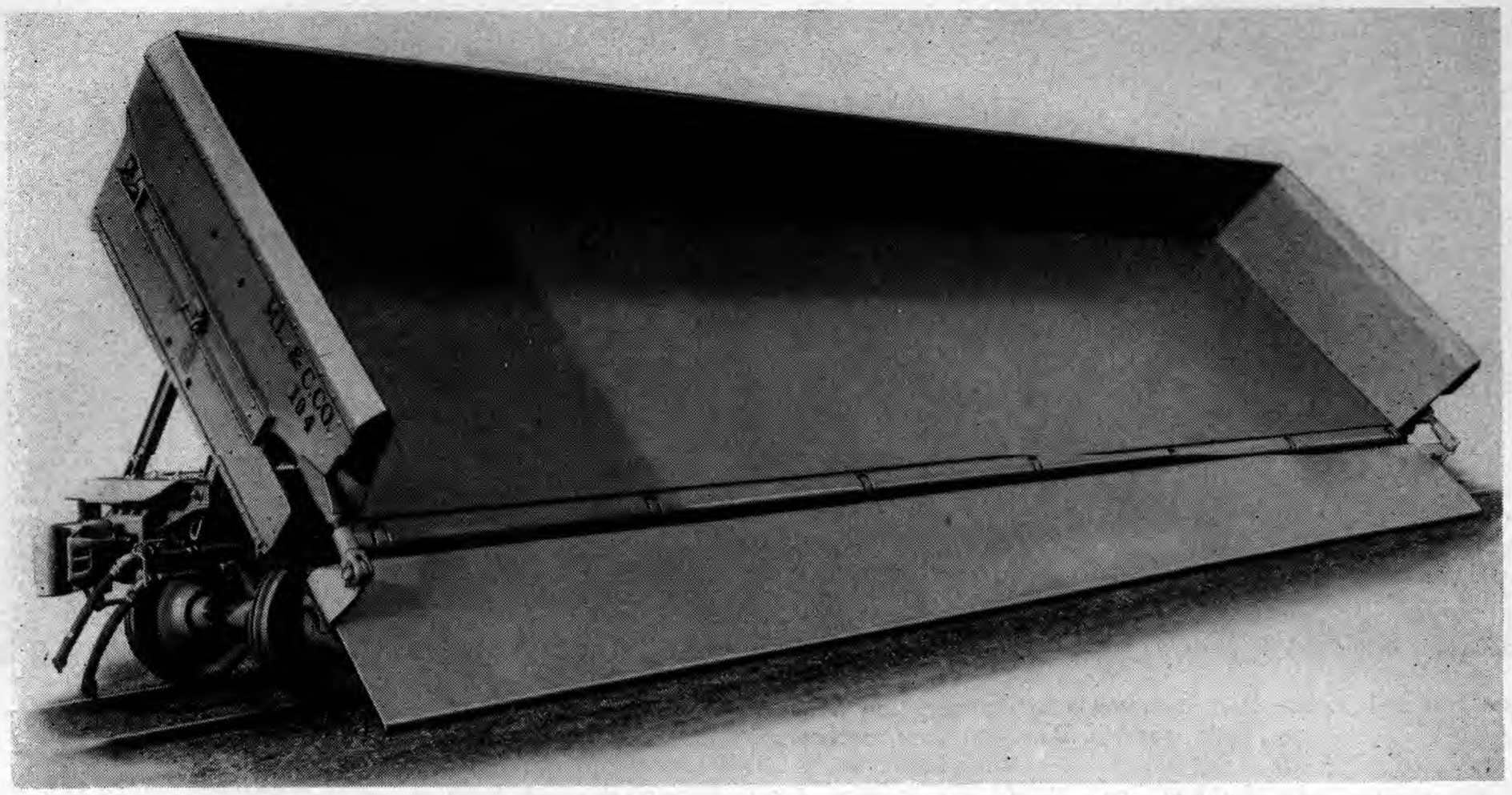
Pennsylvania Railroad caboose or cabin car, Road Class N5C.
Length, inside 23 ft. 3¾ in.; width inside 9 ft. 5¼ in.; length over striking plates, 30 ft. 7½ in.; truck centers, 19 ft. 0 in.; weight, 43,150 lb.

Missouri Pacific drovers' caboose car. Series 1100-1120. A.A.R. Class NM. Builder, St. Louis Car Co.

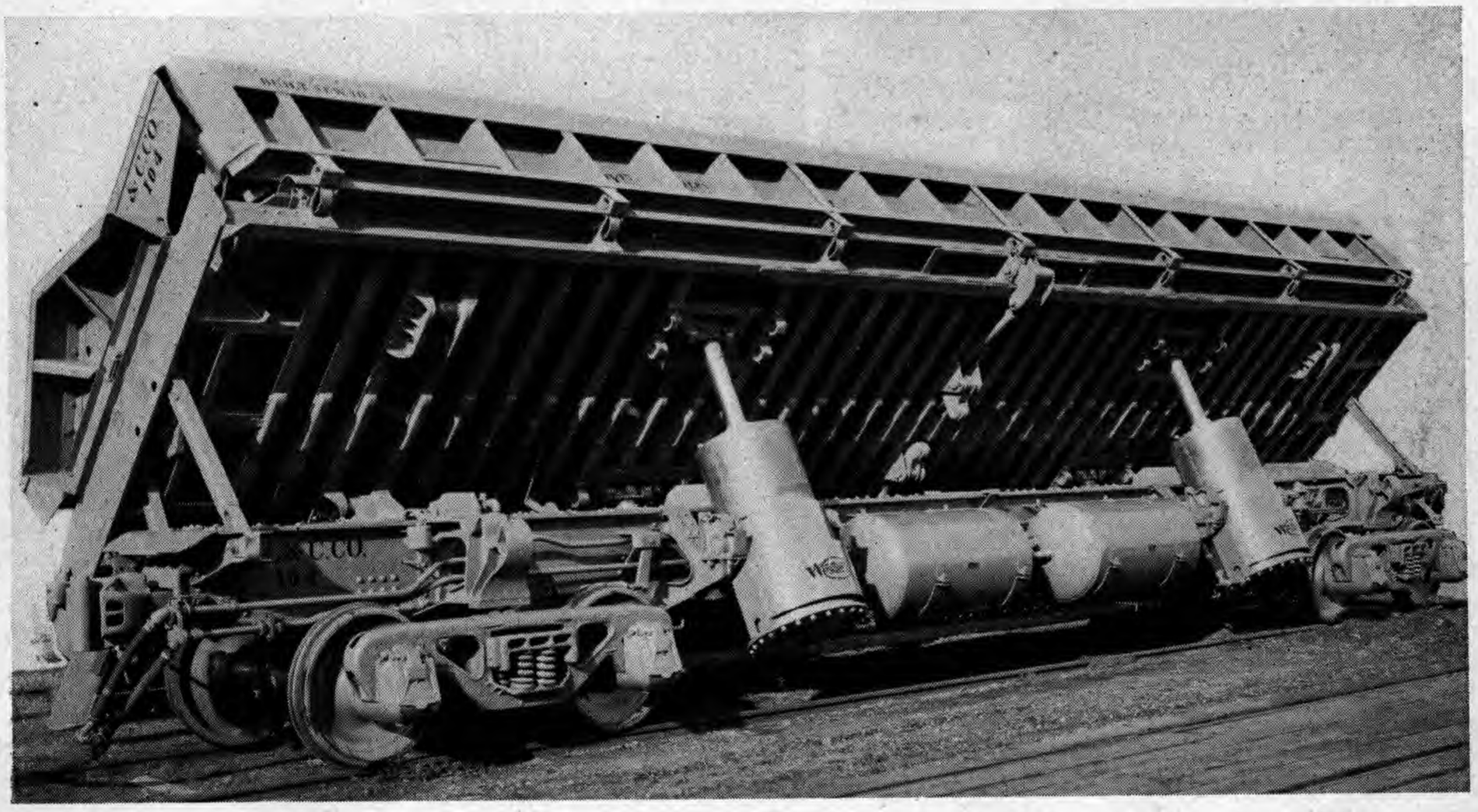


Interior of Missouri Pacific drovers' car shown above.

Interior New York Central rider car.



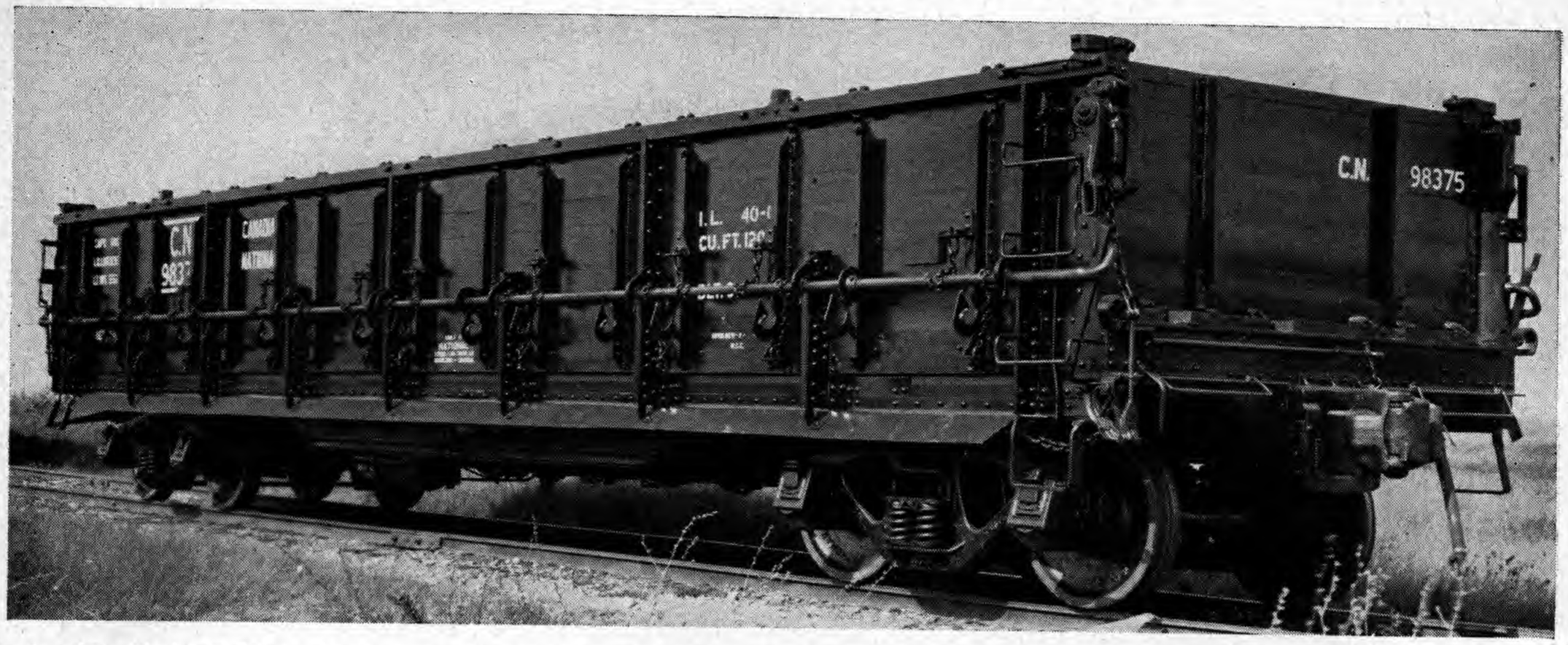
Load side of "Western" 50-yard level-full dual-side-pivot, drop-door, all-steel automatic air-dump car built of high-tensile steel.



Underside view of "Western" air-dump car shown above.

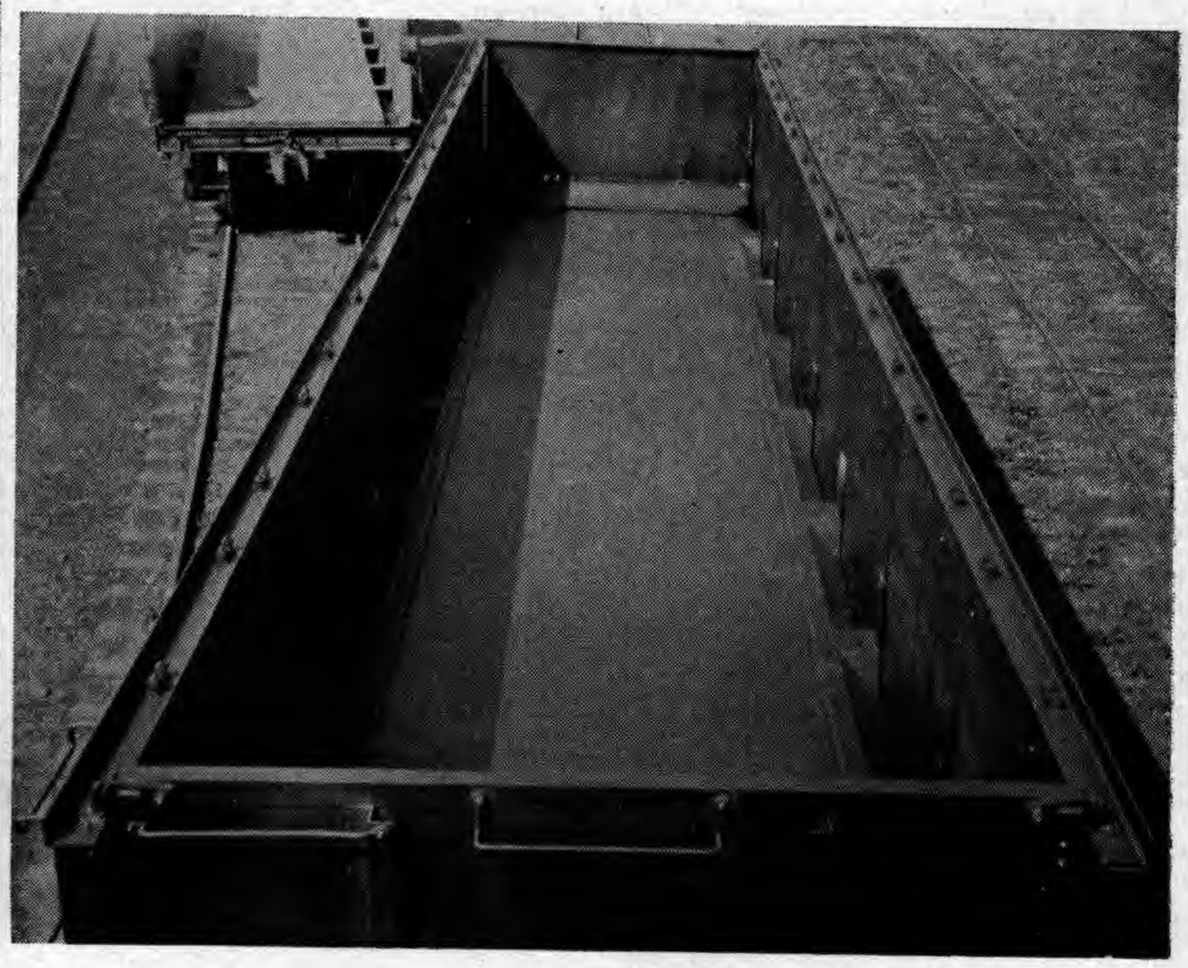
"Western" 40-yard, 90-ton all-steel automatic air-dump car equipped with double floor and reversible doors.

The Austin-Western Company



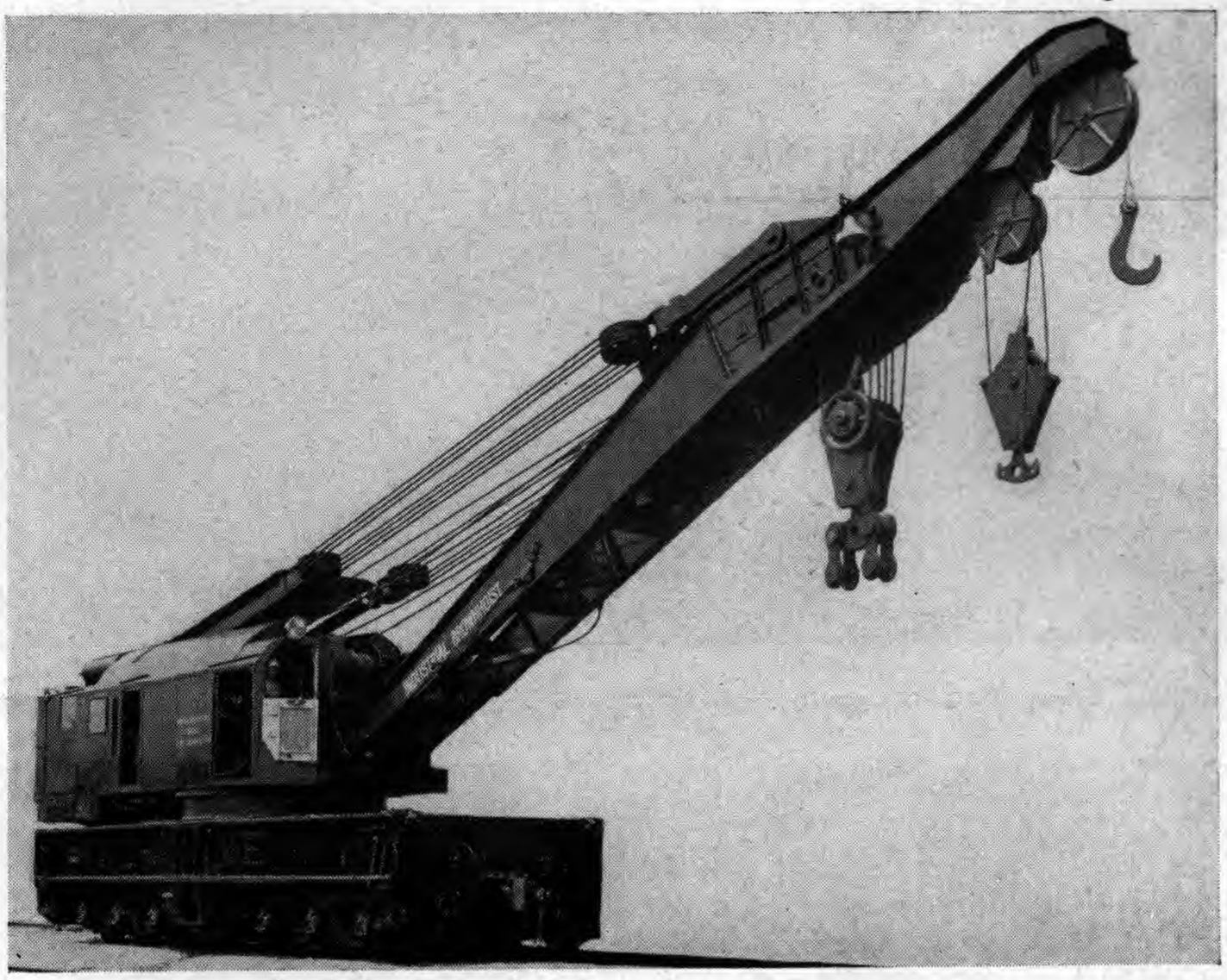
Canadian National 55-ton Hart convertible ballast car. Can be operated as a gondola car with side and center unloading or as a hopper car. Ends movable. Dominion door mechanism. Builder, National Steel Car Corporation, Ltd.
Door mechanism by Dominion Dump Car Co.
Light weight, 55,200 lb.; load limit, 113,800 lb.; capacity, 1,200 cu. ft.; length inside, as gondola 40 ft. 0 in., as hopper 25 ft. 11 in.

Interior of Canadian National convertible ballast car. Center adjusted for operation as a hopper car.

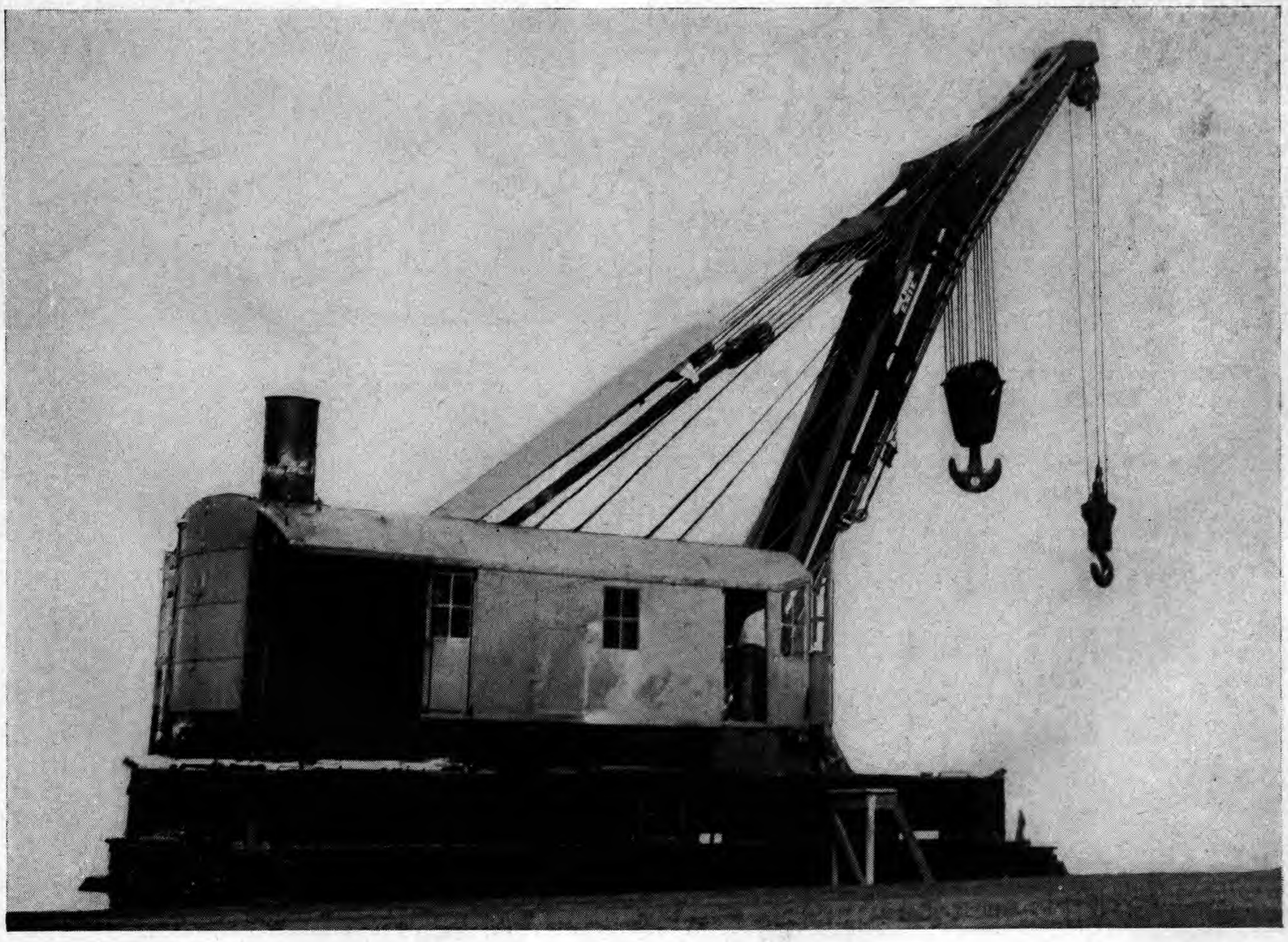


Interior of Ontario Northland side-dumping gondola ballast car.

Ontario Northland 70-ton Hart side-dumping gondola ballast car. A. A. R. Class GD. Builder, National Steel Car Corporation, Ltd.
Inside, length 43 ft. 6 in.; width 8 ft. 9 in.; height of sides, 4 ft. 4 in.; capacity, 1,670 cu. ft.



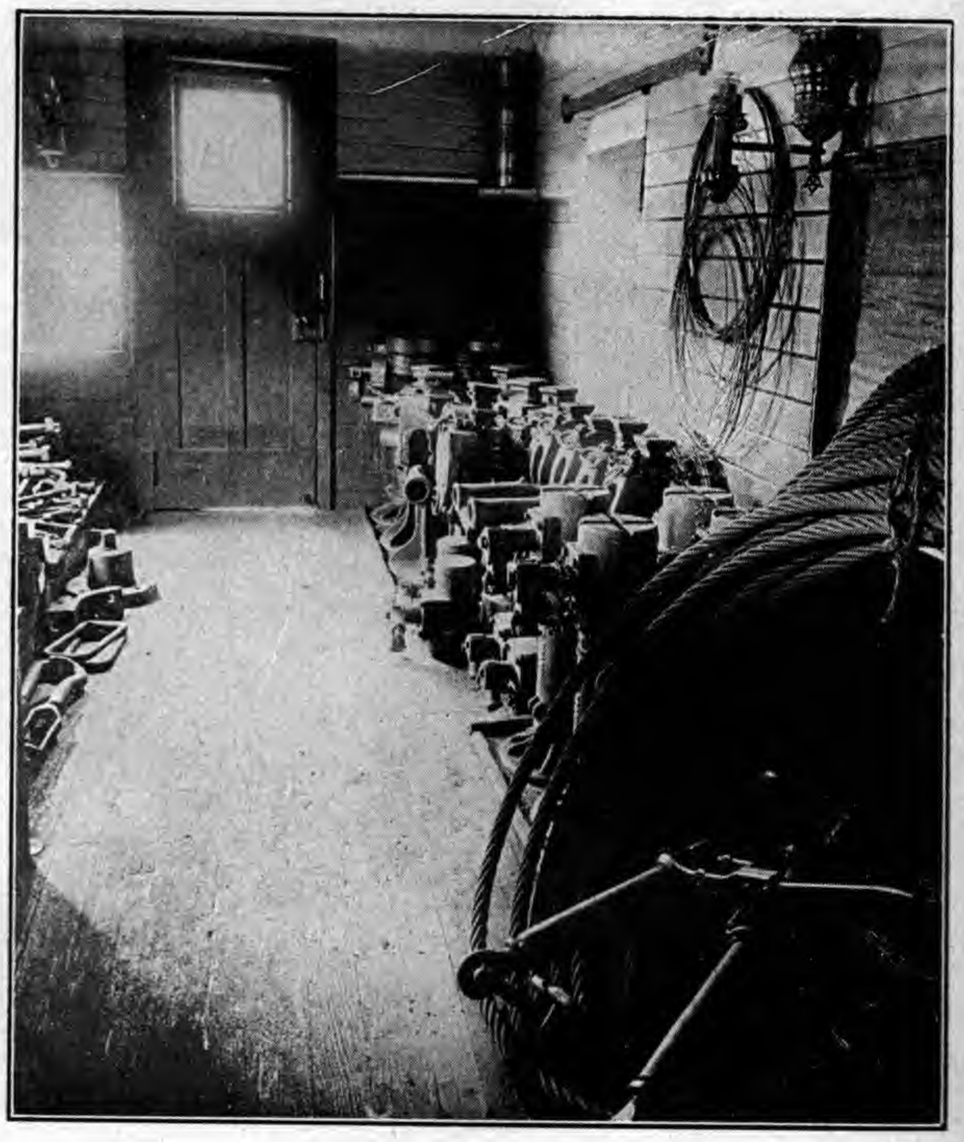
Norfolk and Western 250-ton Diesel wrecking crane. Designed and built by the Industrial-Brownhoist Corporation.



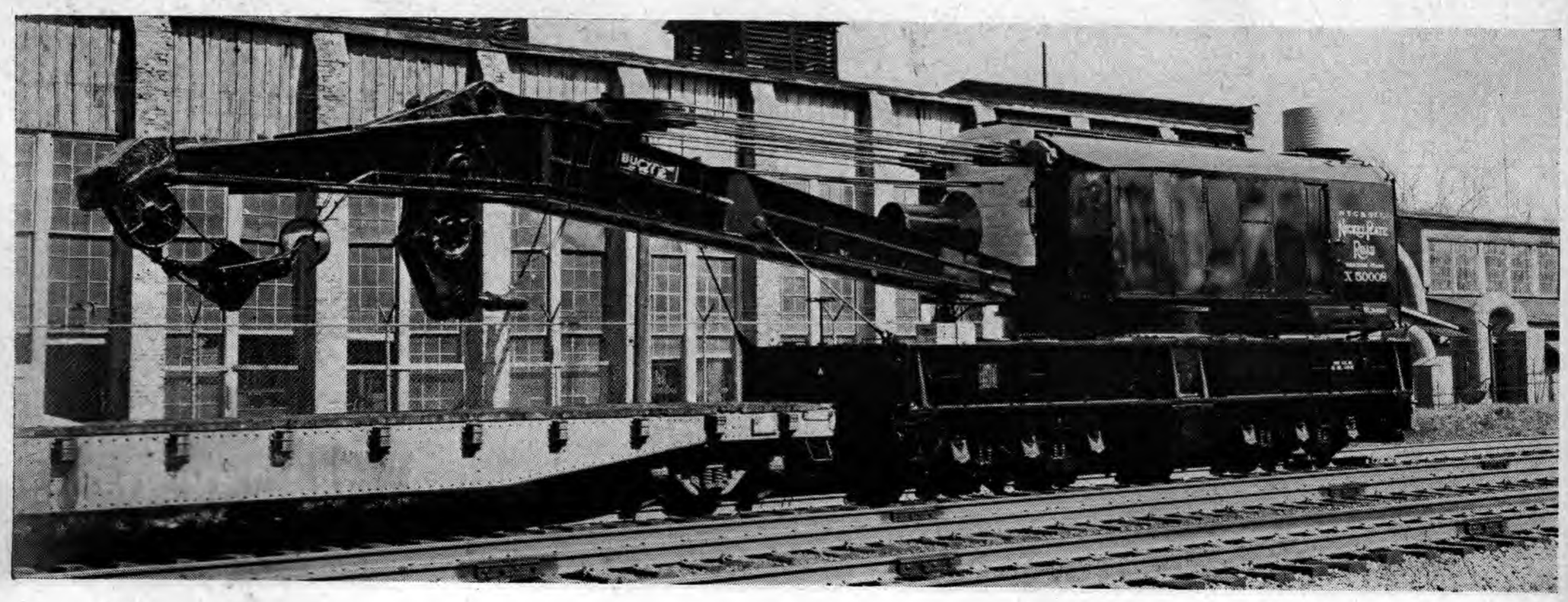
Southern Pacific 250-ton railway wrecking crane, built by Bucyrus-Erie. The auxiliary hook has a lifting capacity of from 48 to 60 tons.

Gas-Electric wrecking crane, 105 tons capacity, built for Cleveland Union Terminals by Industrial Brownhoist Corporation.

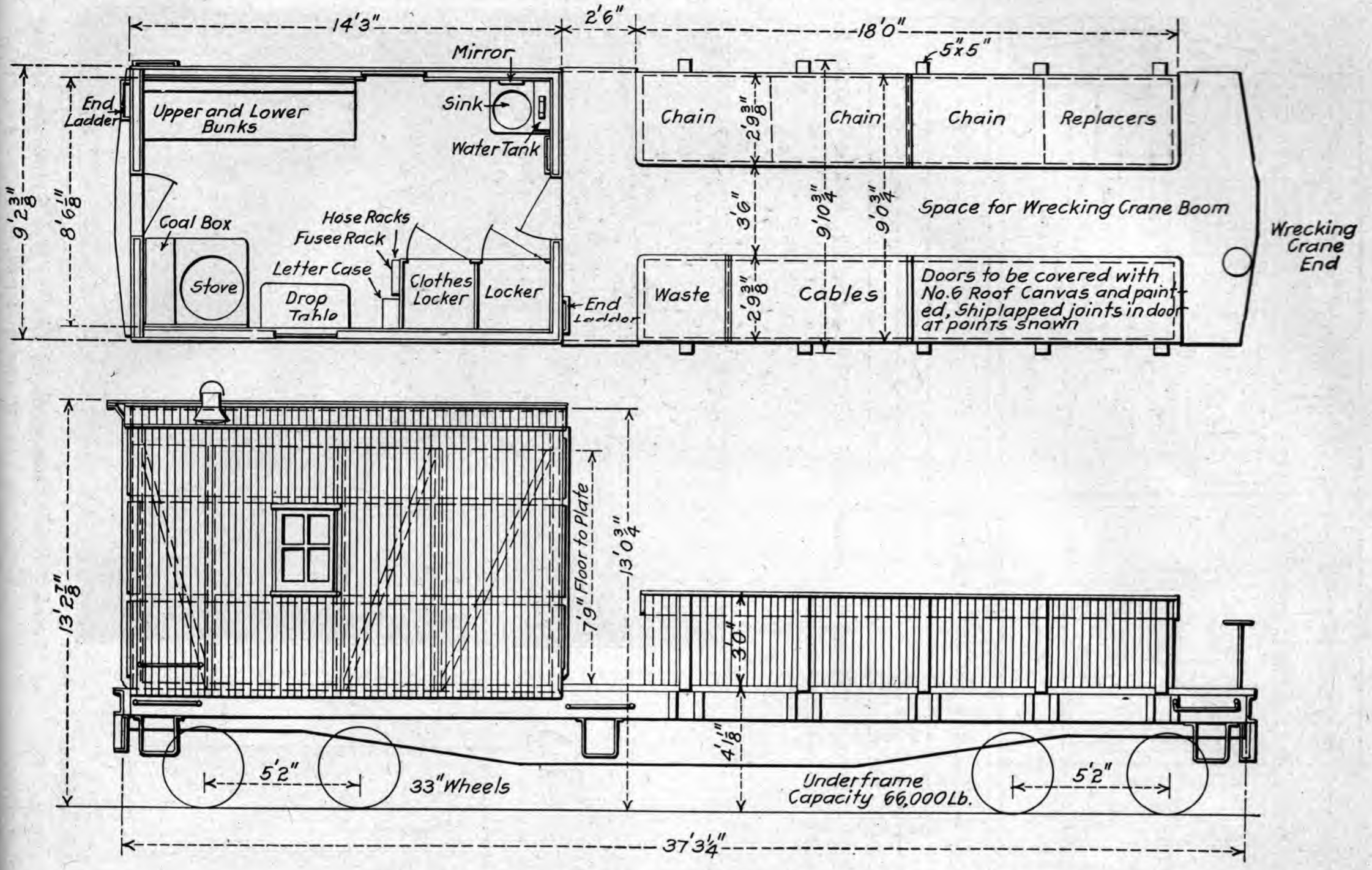
250-ton wrecking crane built for Pennsylvania Railroad by Industrial Brownhoist Corp.



Interior of Baltimore & Ohio tool car.

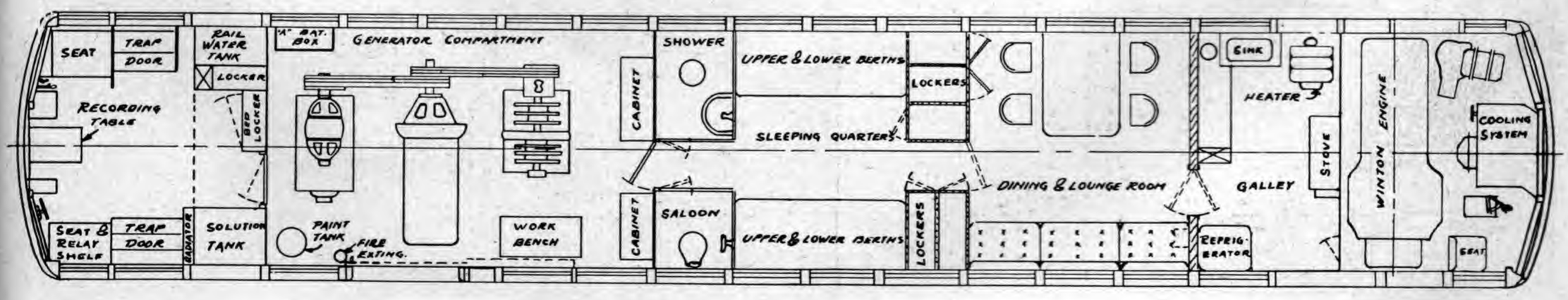


Nickel Plate wrecking crane; capacity, 250 tons at 17½-ft. radius; weight, 369,000 lb. Builder, Bucyrus-Erie Co.

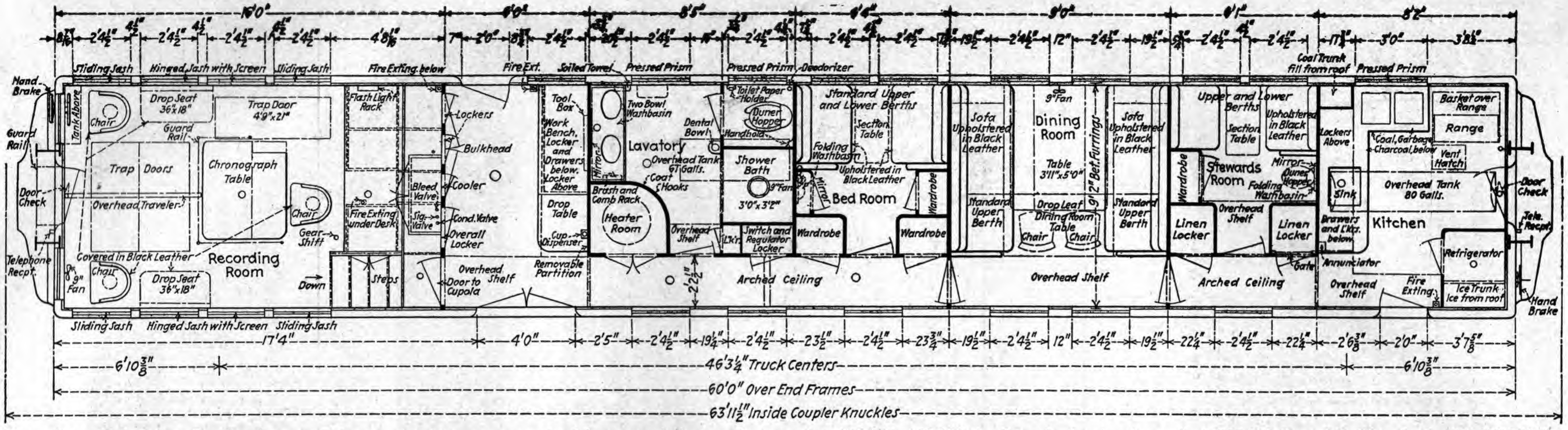


Canadian National Railways auxiliary car for wrecking crane.

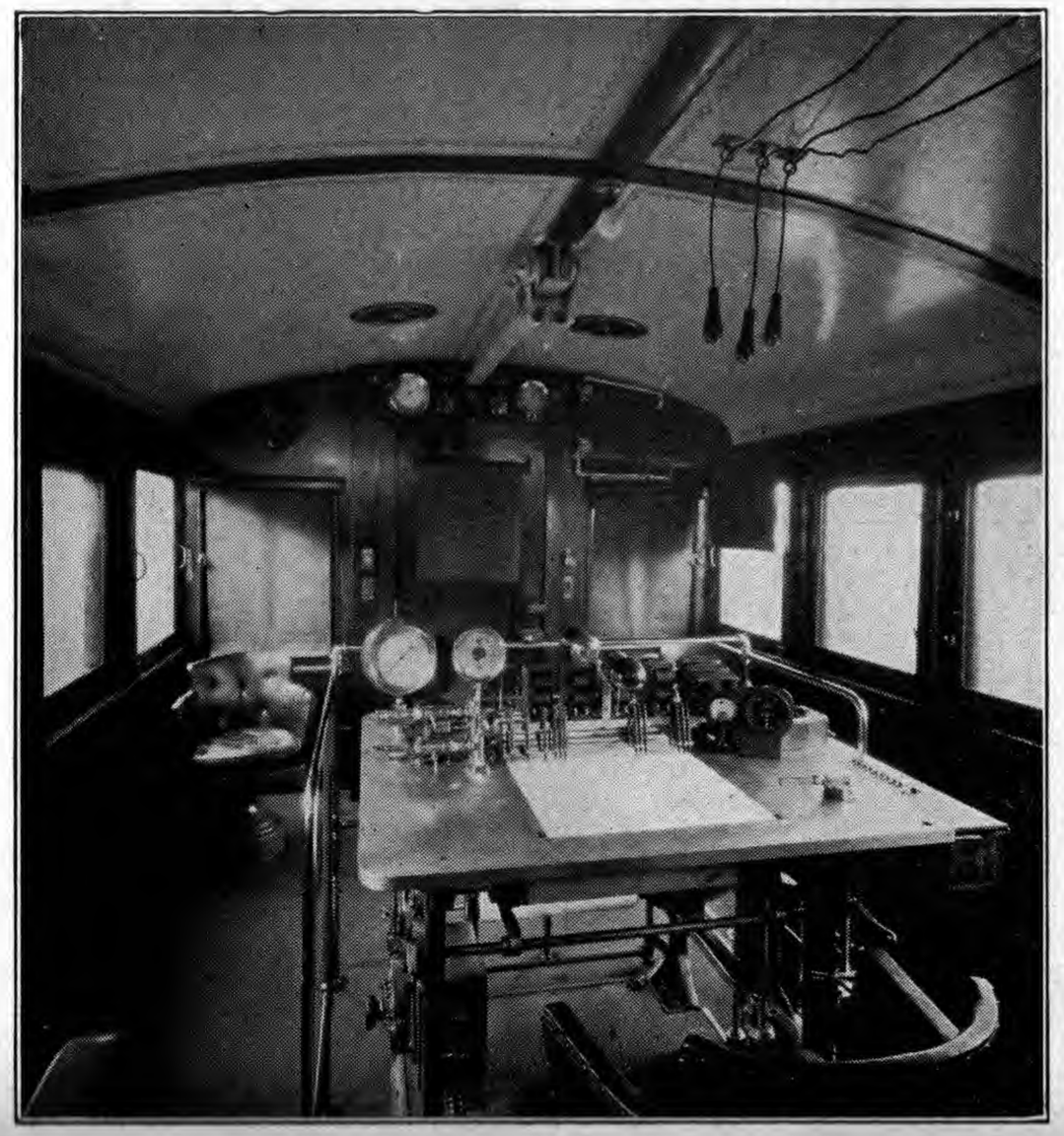
Sperry Detector Car for rail fissures. Sperry Rail Service



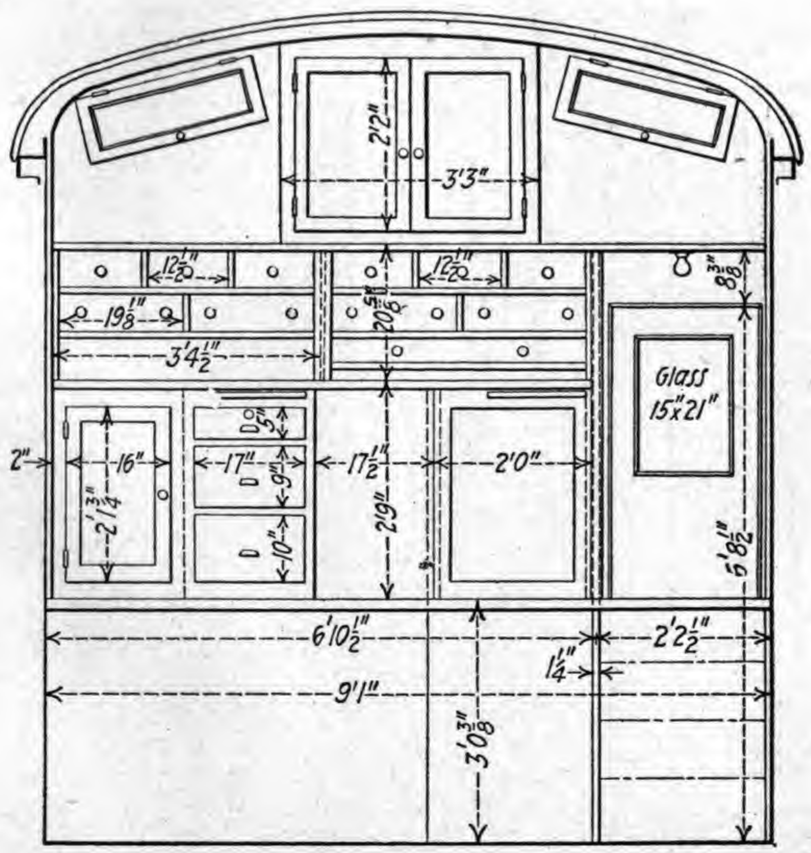
Plan arrangement of a Sperry Rail Detector car. Sperry Rail Service.



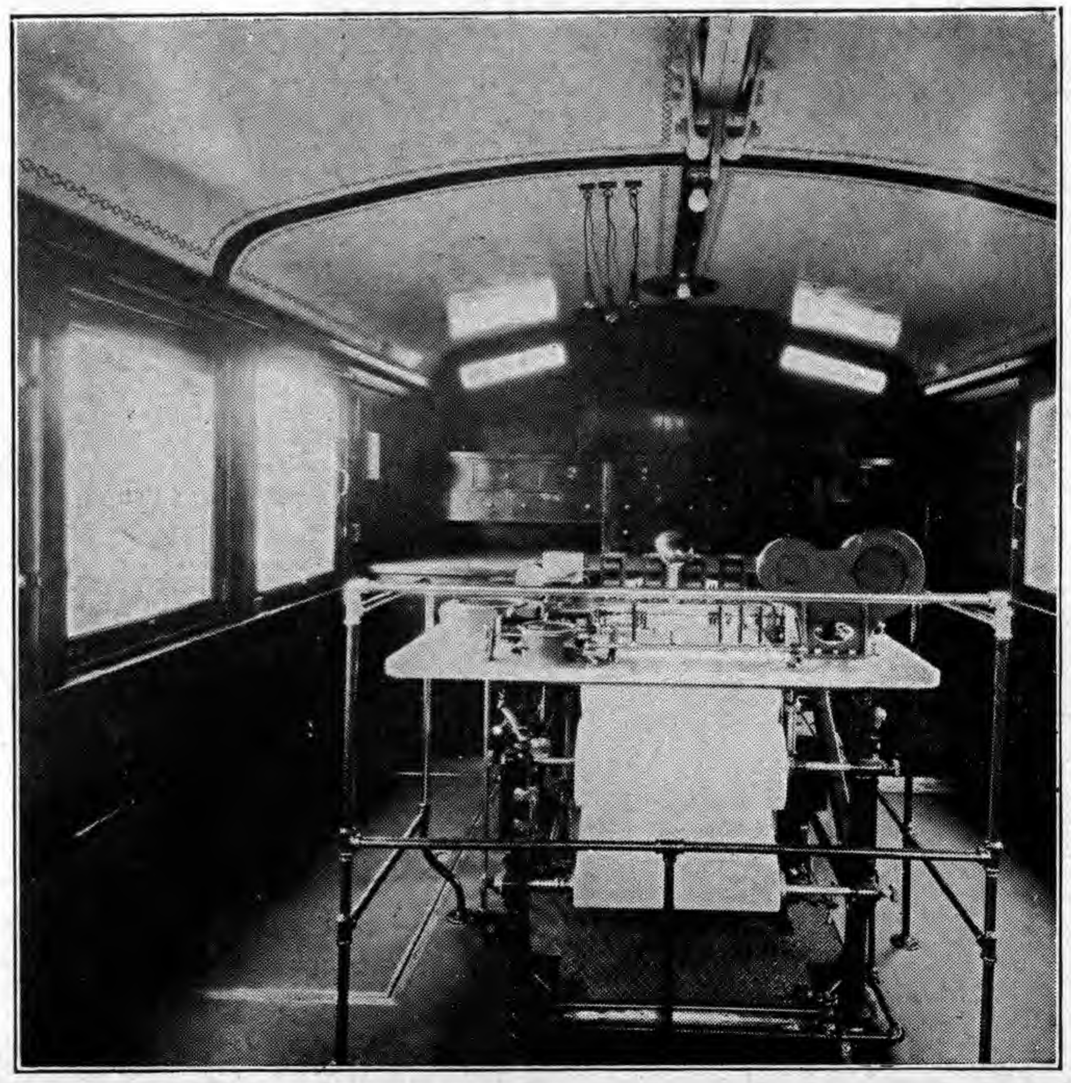
Floor plan of Canadian Pacific dynamometer car showing arrangement of accommodations and apparatus. Weight, 145,000 lb. Capacity for drawbar pull of 500,000 lb. and buffing shock of 1,250,000 lb.; Chronograph space elevated with sub-floor for weighing head and transmission.



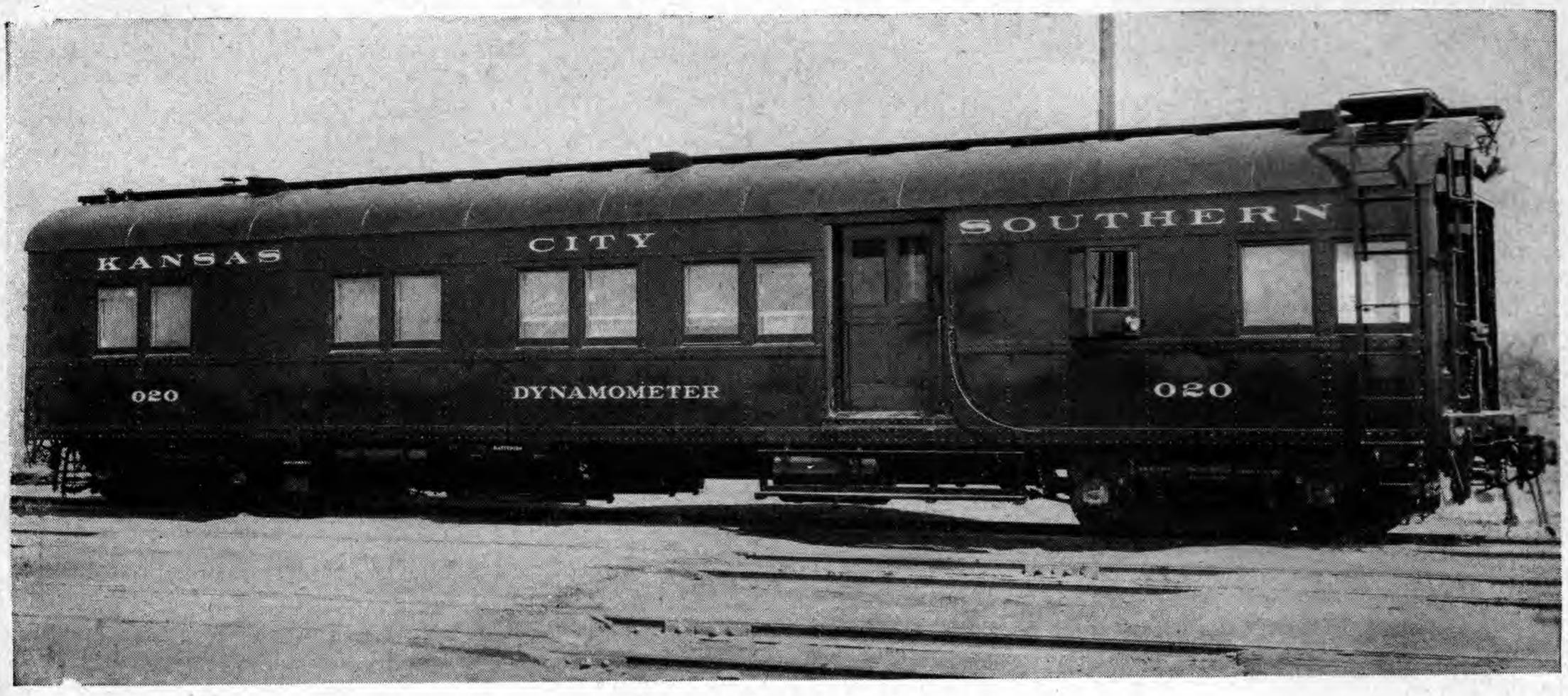
Canadian Pacific chronograph table looking toward front end of car.



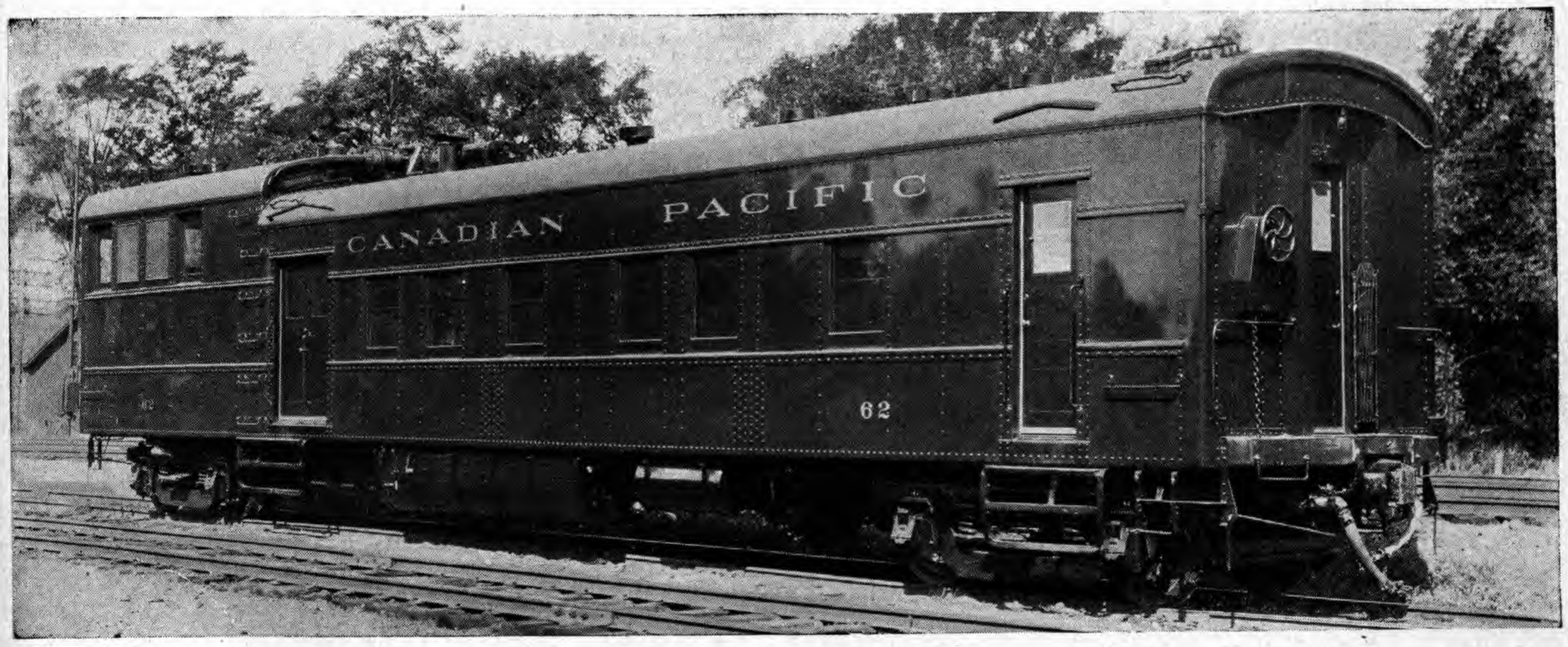
Arrangement of operator's desk and cupboard space. Recording room floor in cupola is 3 ft. 0⅜ in. above general floor level of car.



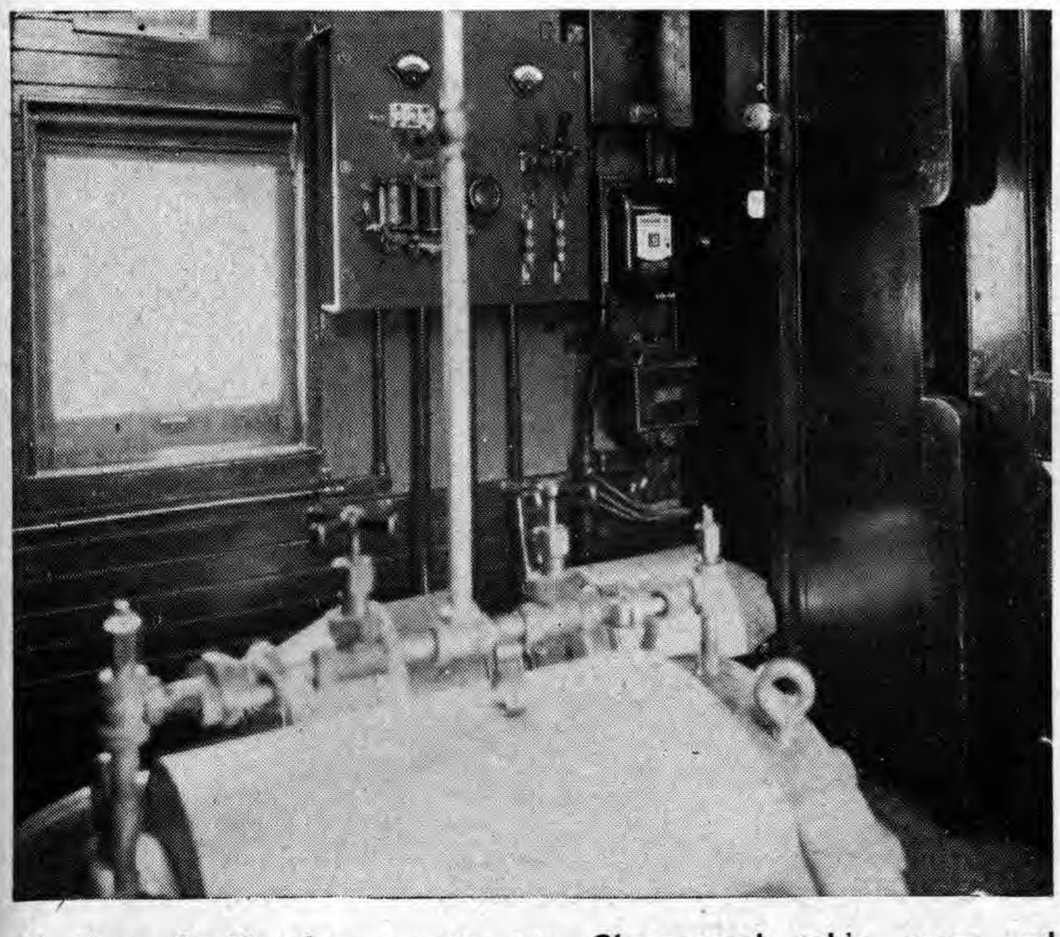
Canadian Pacific chronograph table looking toward removable partition at rear of cupola.



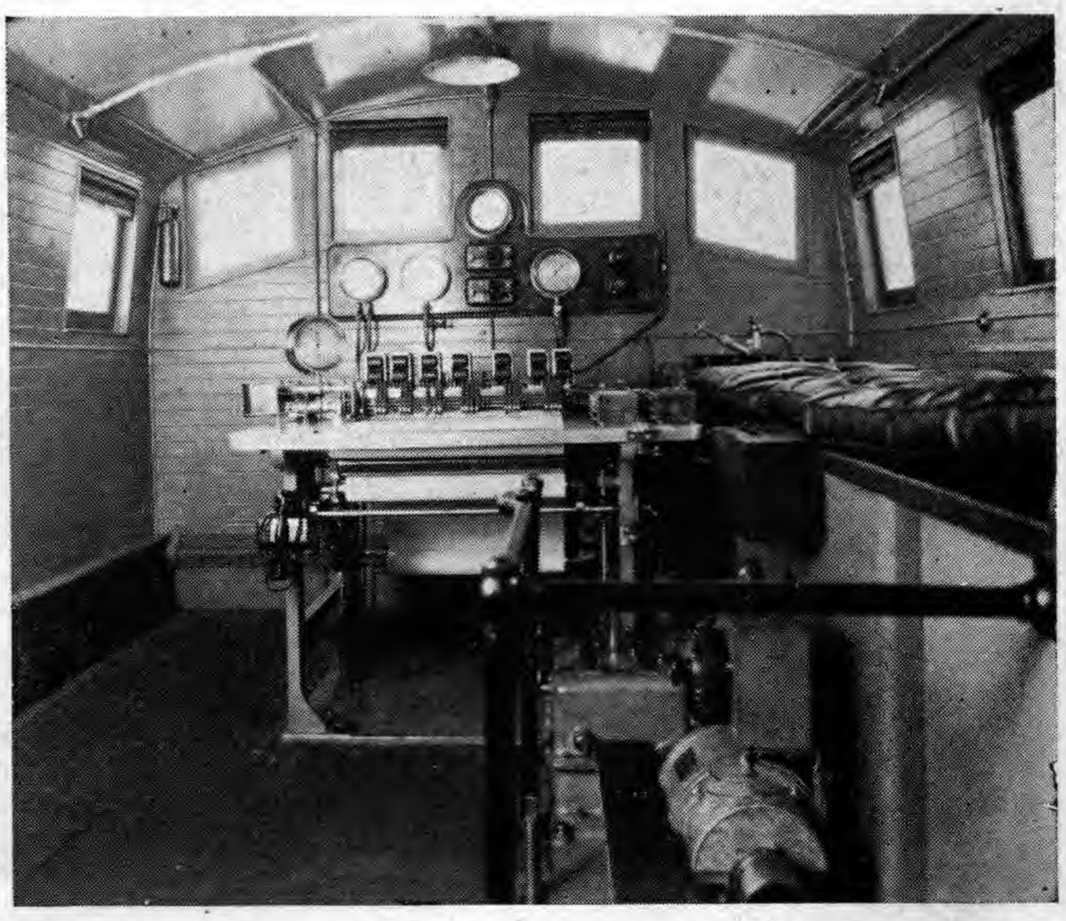
Canadian Pacific dynamometer car.



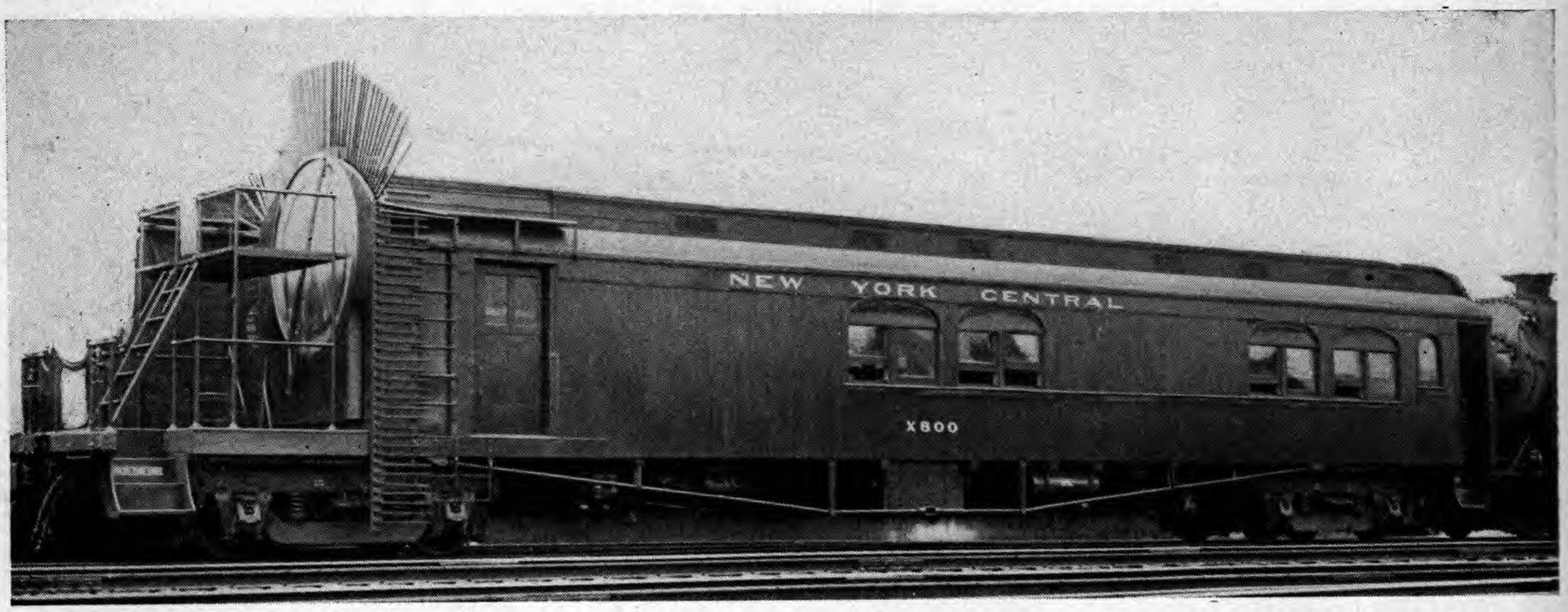
Kansas City Southern dynamometer car.



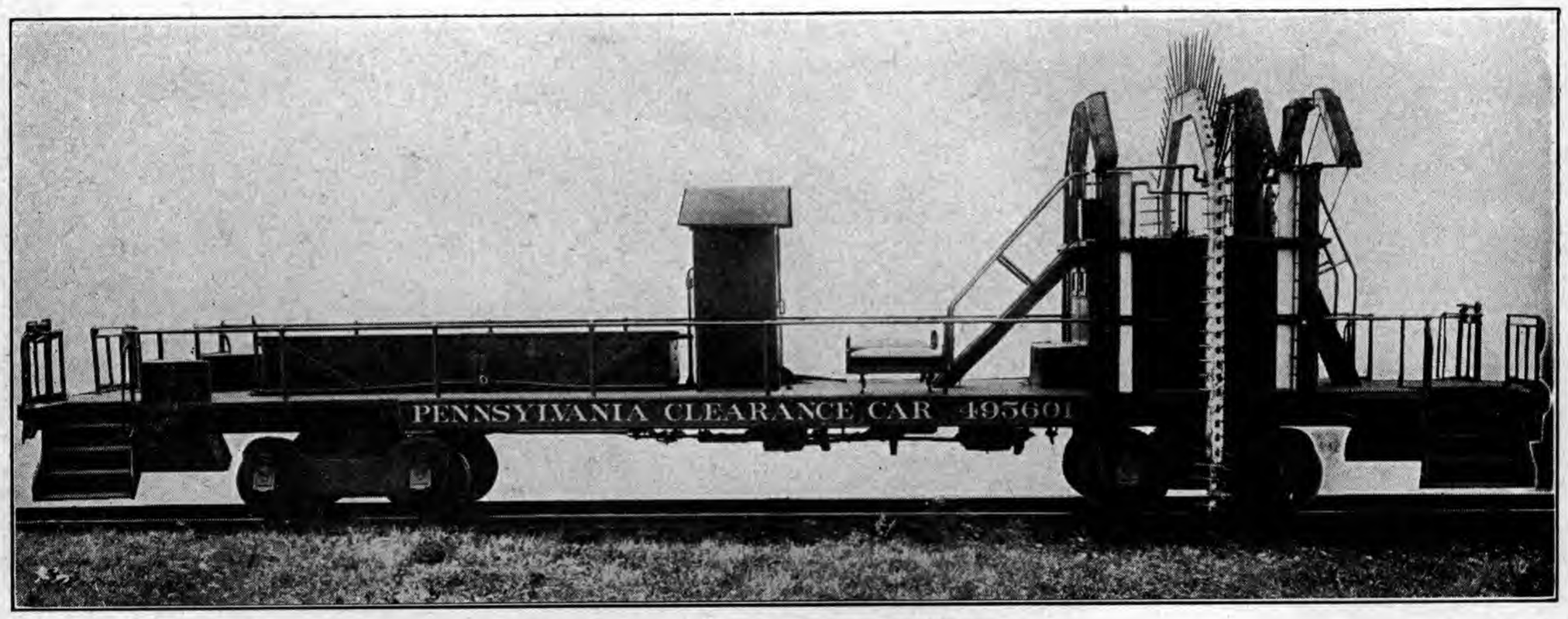
Northern Pacific dynamometer car. Chronograph table, gages and generator and panel for charging batteries in background.



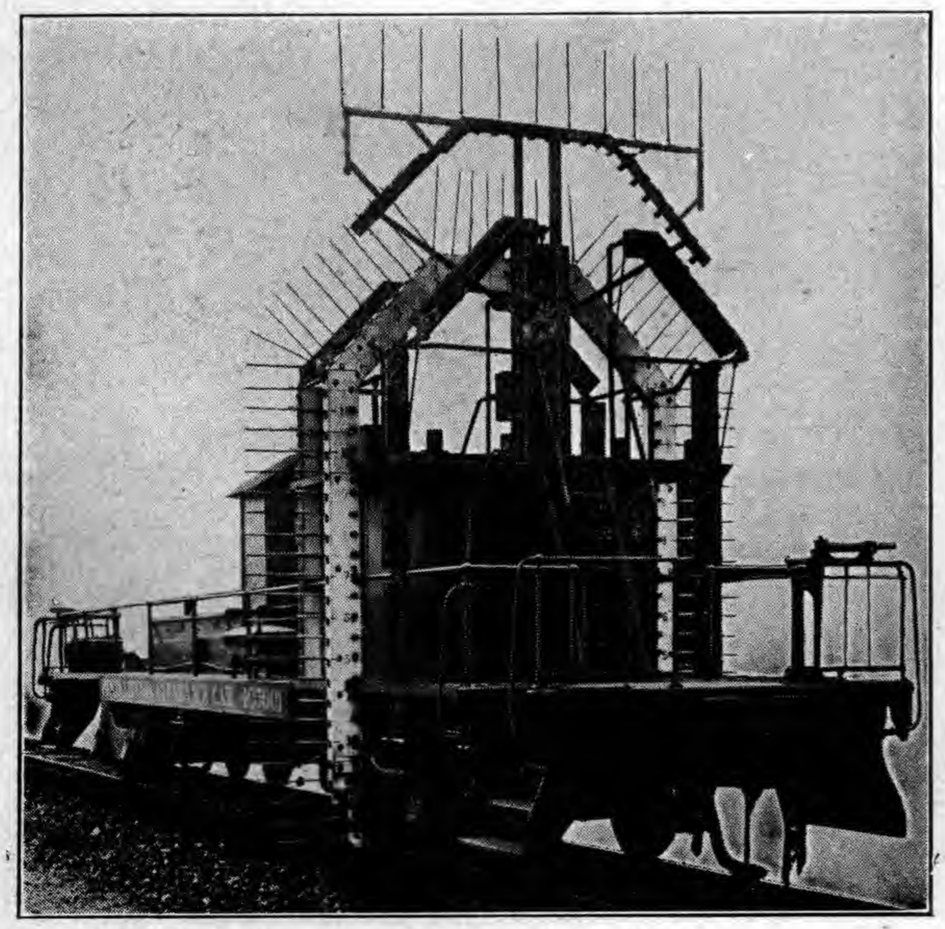
Northern Pacific dynamometer car. Weighing head with motor-recording instruments.



New York Central Clearance Car. Fitted up at West Albany shops. Equipped with 112 oak feelers extending 7 ft. 6 in. from center. Pantograph in front is 6 ft. diameter and connected to a small pantograph inside the car which makes paper records.

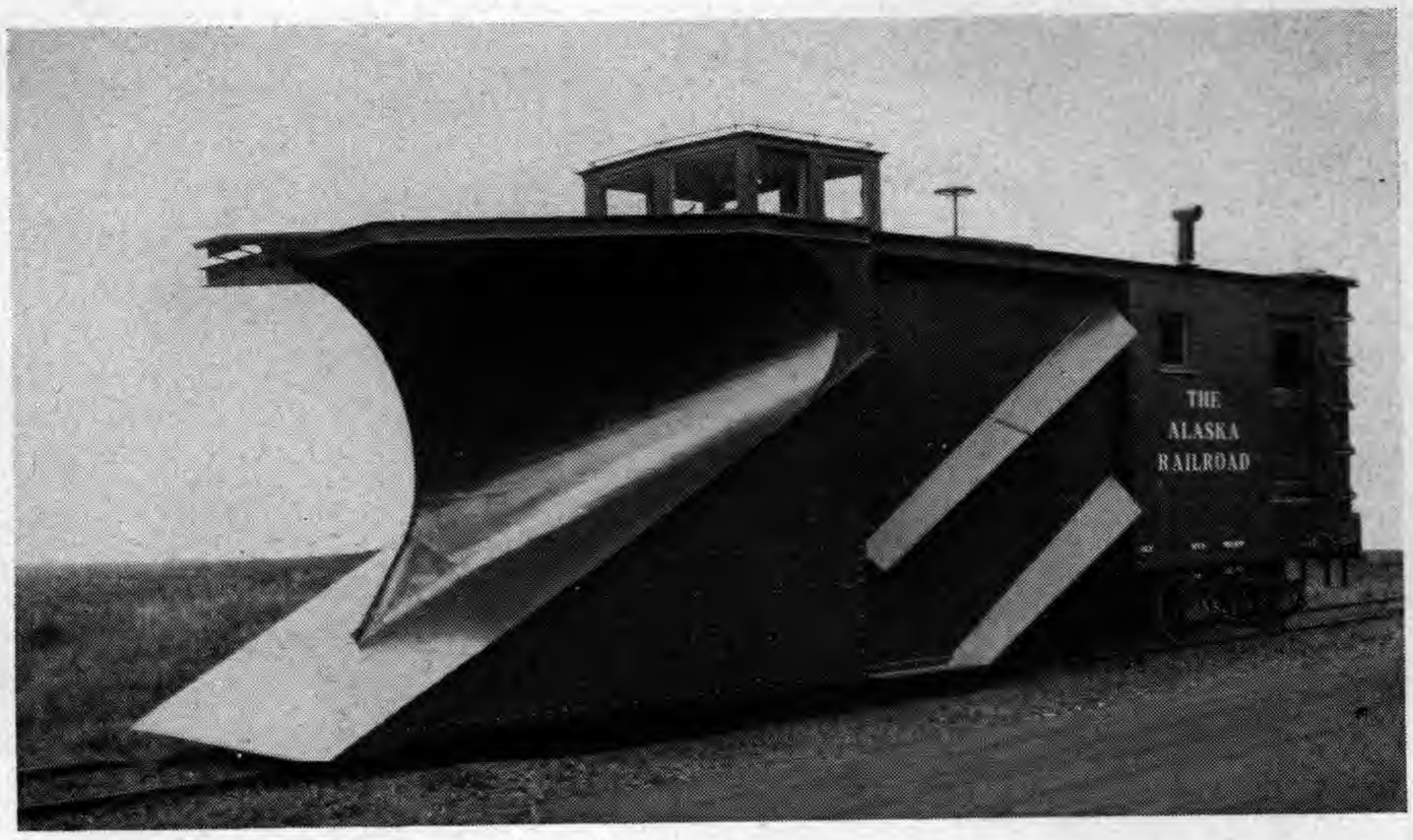


Clearance car for The Pennsylvania Railroad.

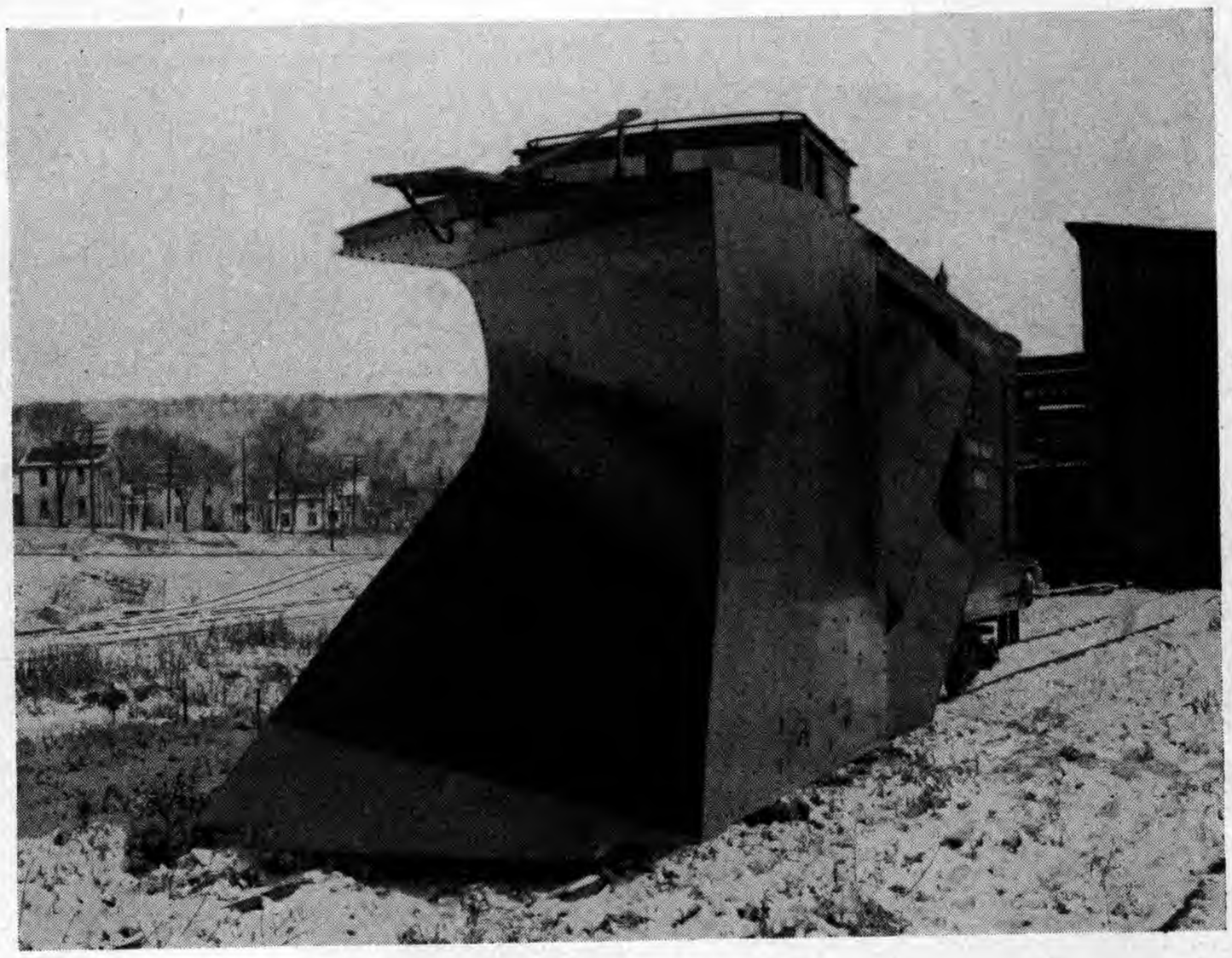


Front elevation of Pennsylvania clearance car.

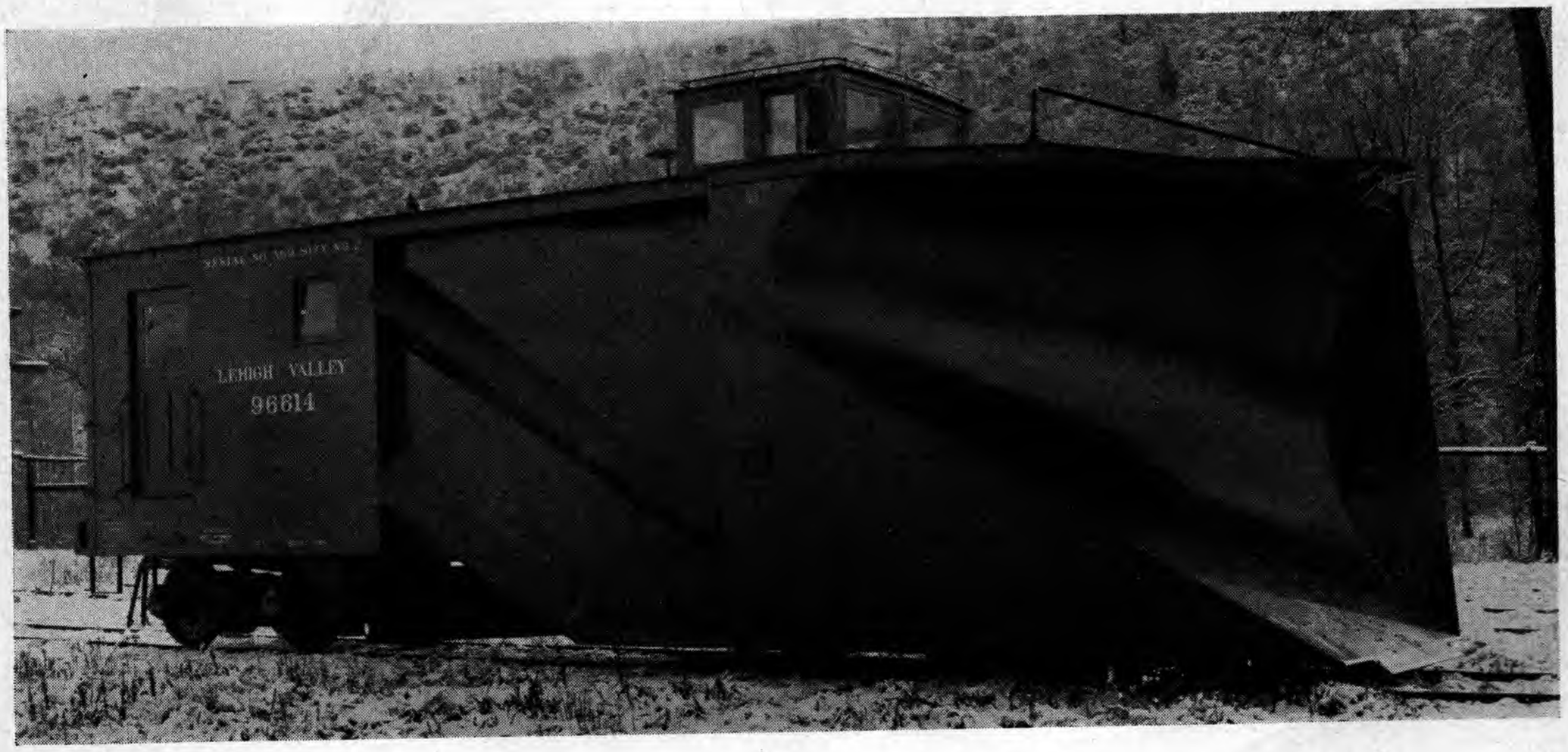
Great Northern weed scalder car with clipper, discer and sprayers.

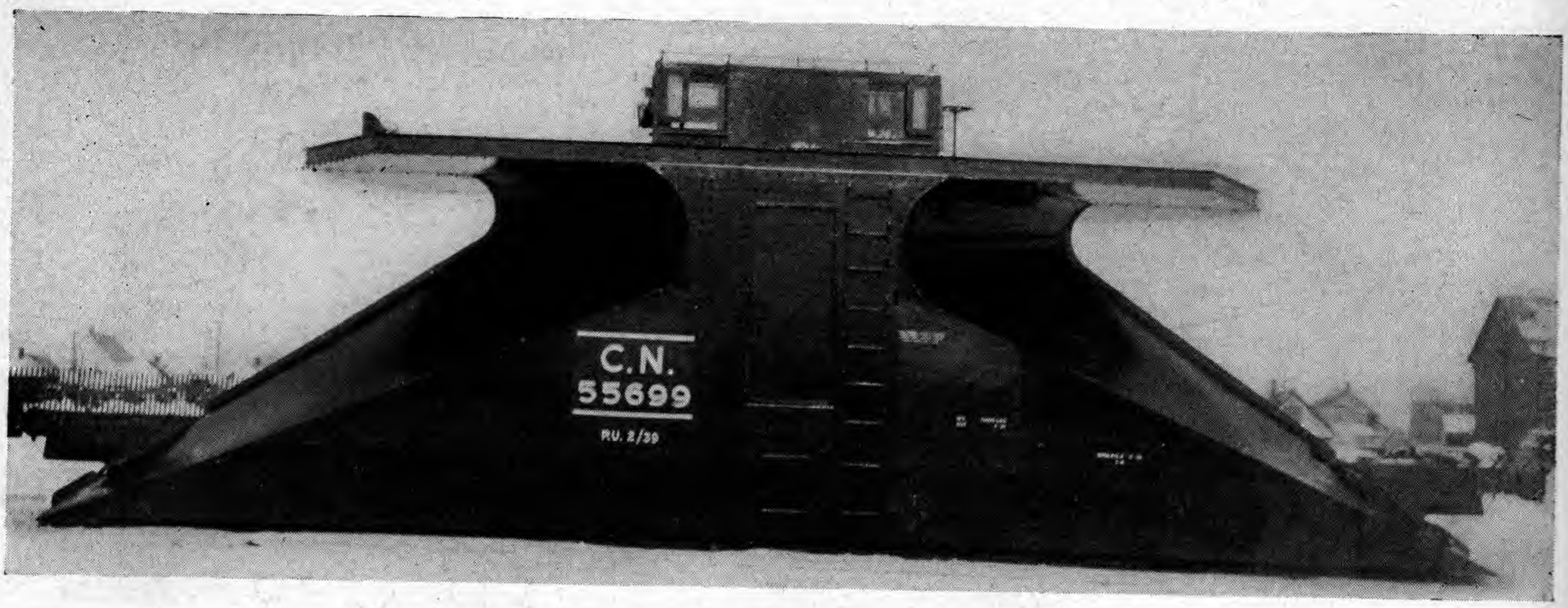


Alaska all-steel snow plow for single-track operation. Builder, Russell Snow Plow Company.

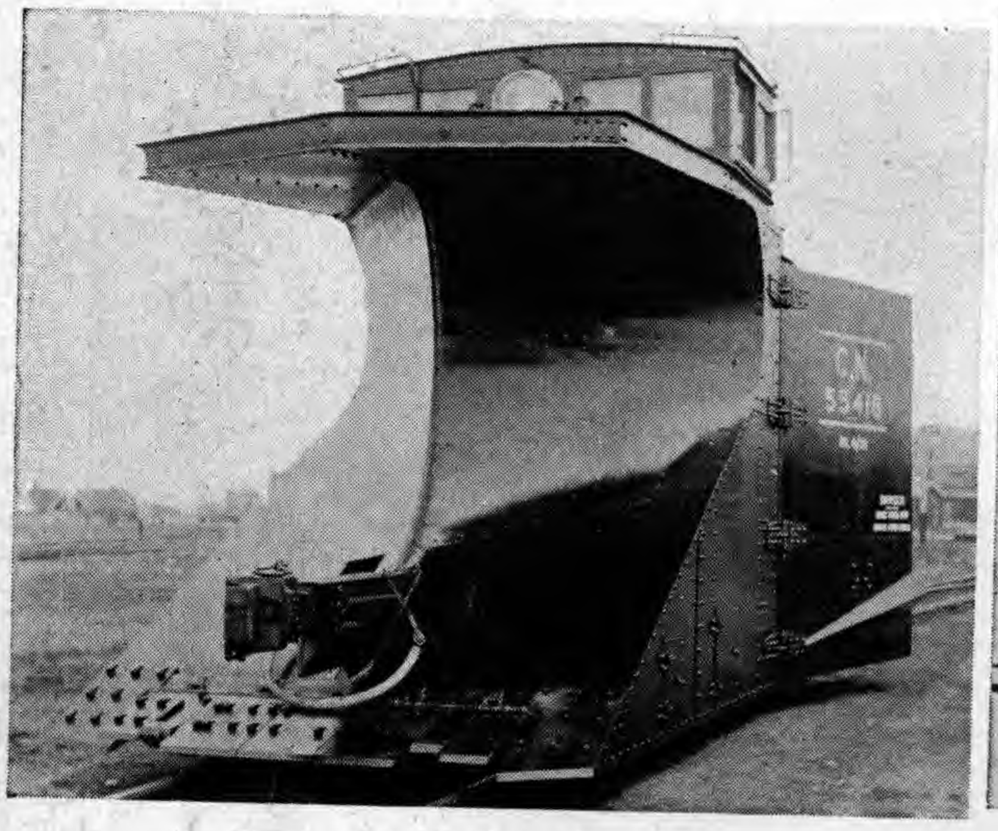


Right and below—Lehigh Valley all-steel snow plow for double-track operation. Builder, Russell Snow Plow Company.

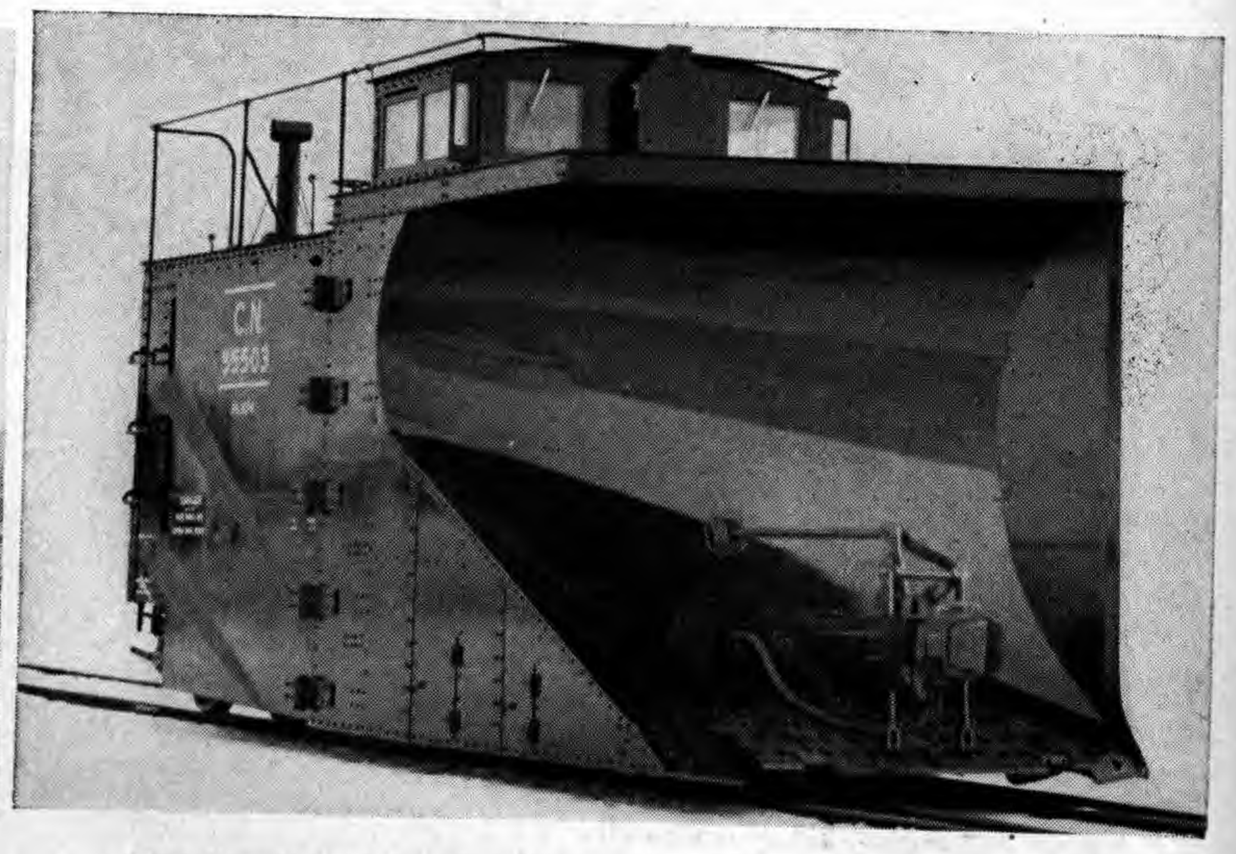




Canadian National snow-plow for region where plow can not be turned.



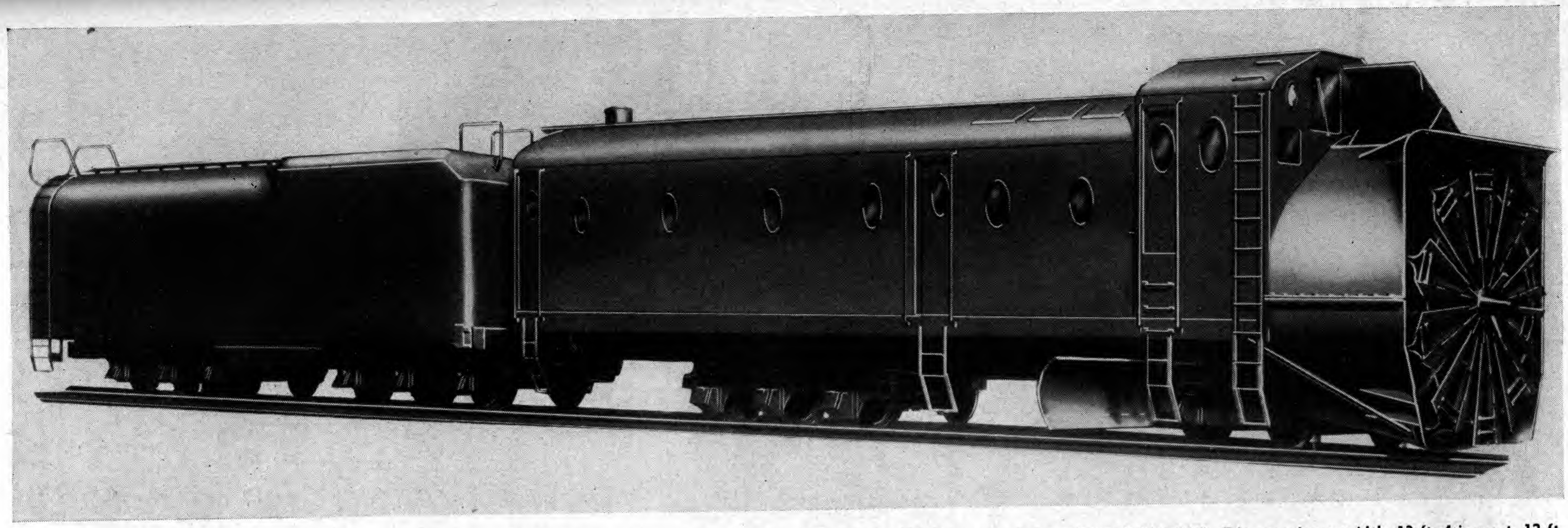
Front view of plow shown below.



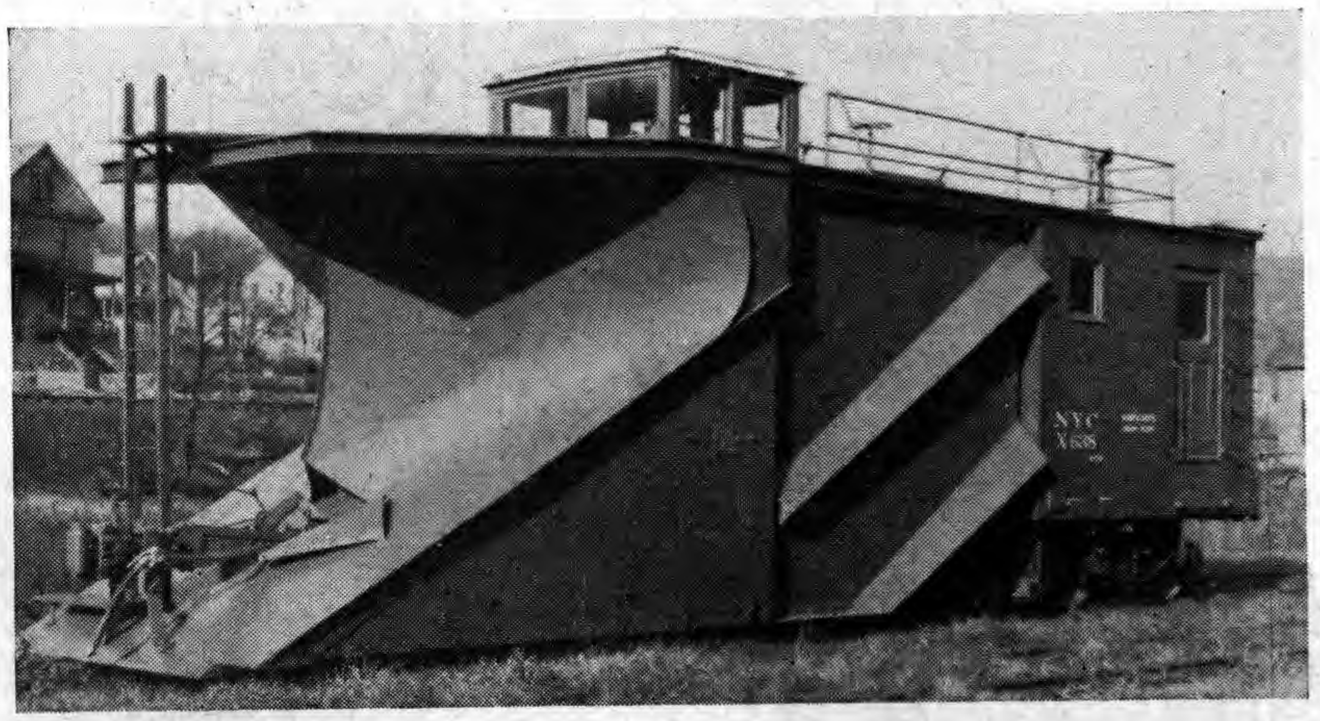
Canadian National snow plow for operation on double-track lines.

Canadian National drop-nose snow-plow for single-track operation. Wings operated by compressed air.

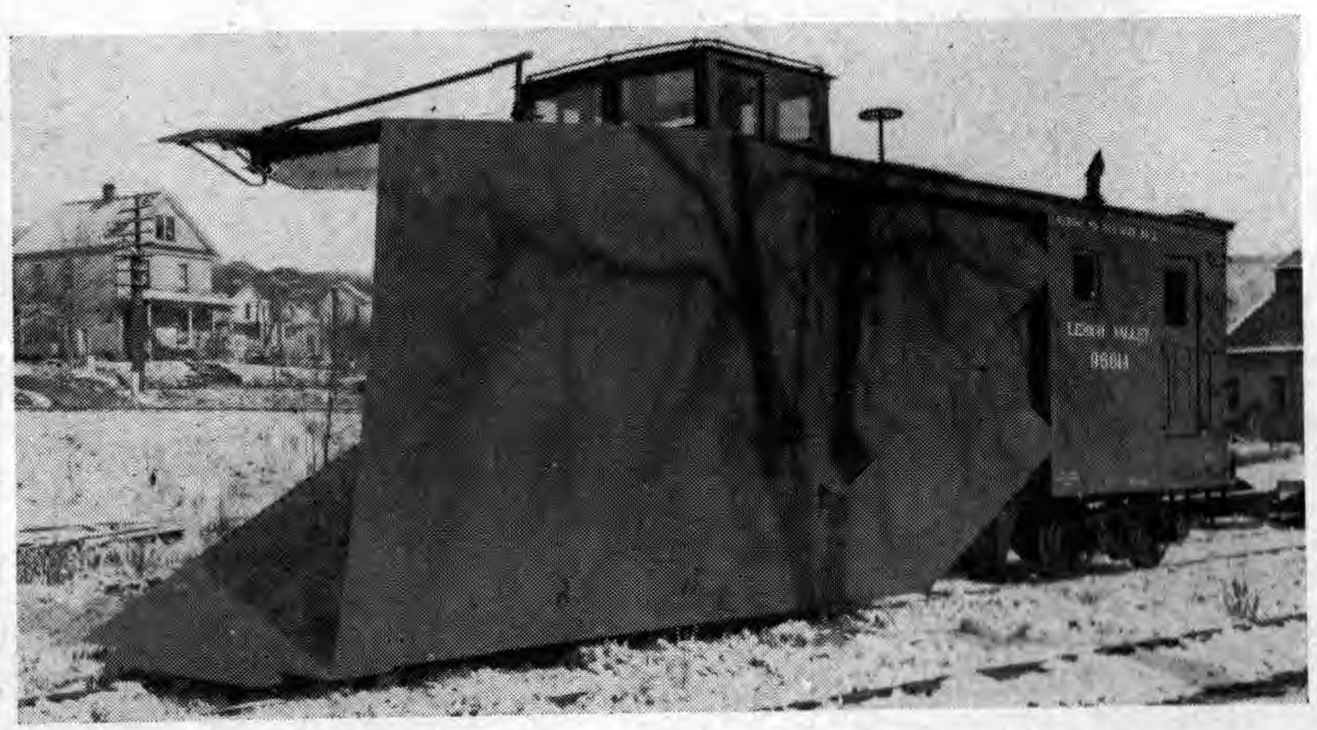
Length over all, 32 ft. 0 in.; truck centers, 18 ft. 0 in.; width over wings (closed), 11 ft. 0 in.; (extended), 16 ft. 0 in.; weight, 69,300 lb.



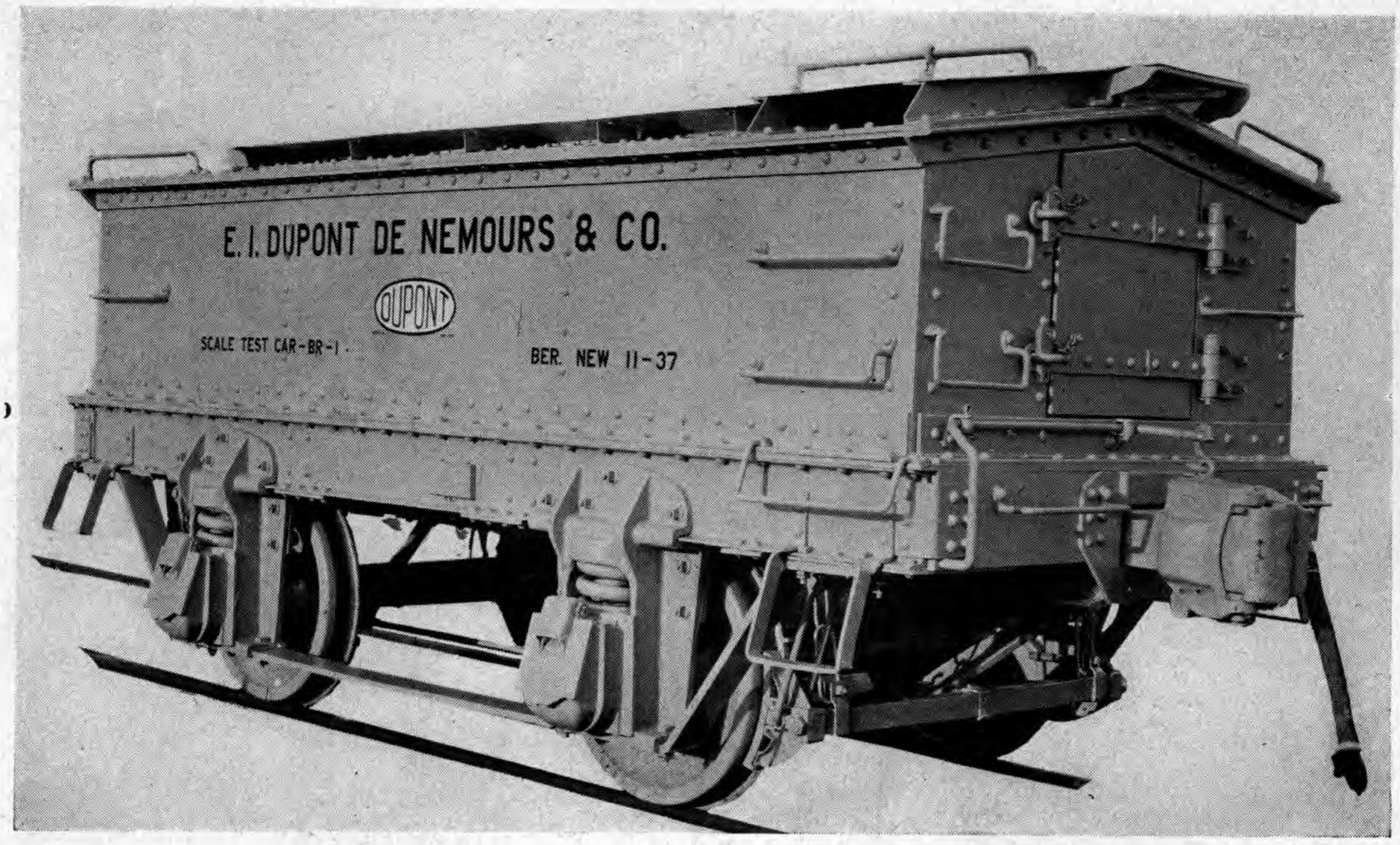
Lima-Hamilton 1,500-hp. rotary snow plow; rotor speed, 150 r.p.m.; engine, two 3-cyl., 13-in. by 15-in., piston-valve, 200 lb. per sq. in.; maximum height, 16 ft. 5 in.; maximum width, 13 ft. 4 in.; cut, 12 ft. 0 in.; outside diameter boiler, 80 in.; wheelbase, front truck, 4 ft. 8 in., rear truck, 9 ft. 0 in.; total weight, 260,000 lb. Tender supplied by railroad. Pows being built for Union Pacific, Soo Line and Chicago, Rock Island & Pacific.



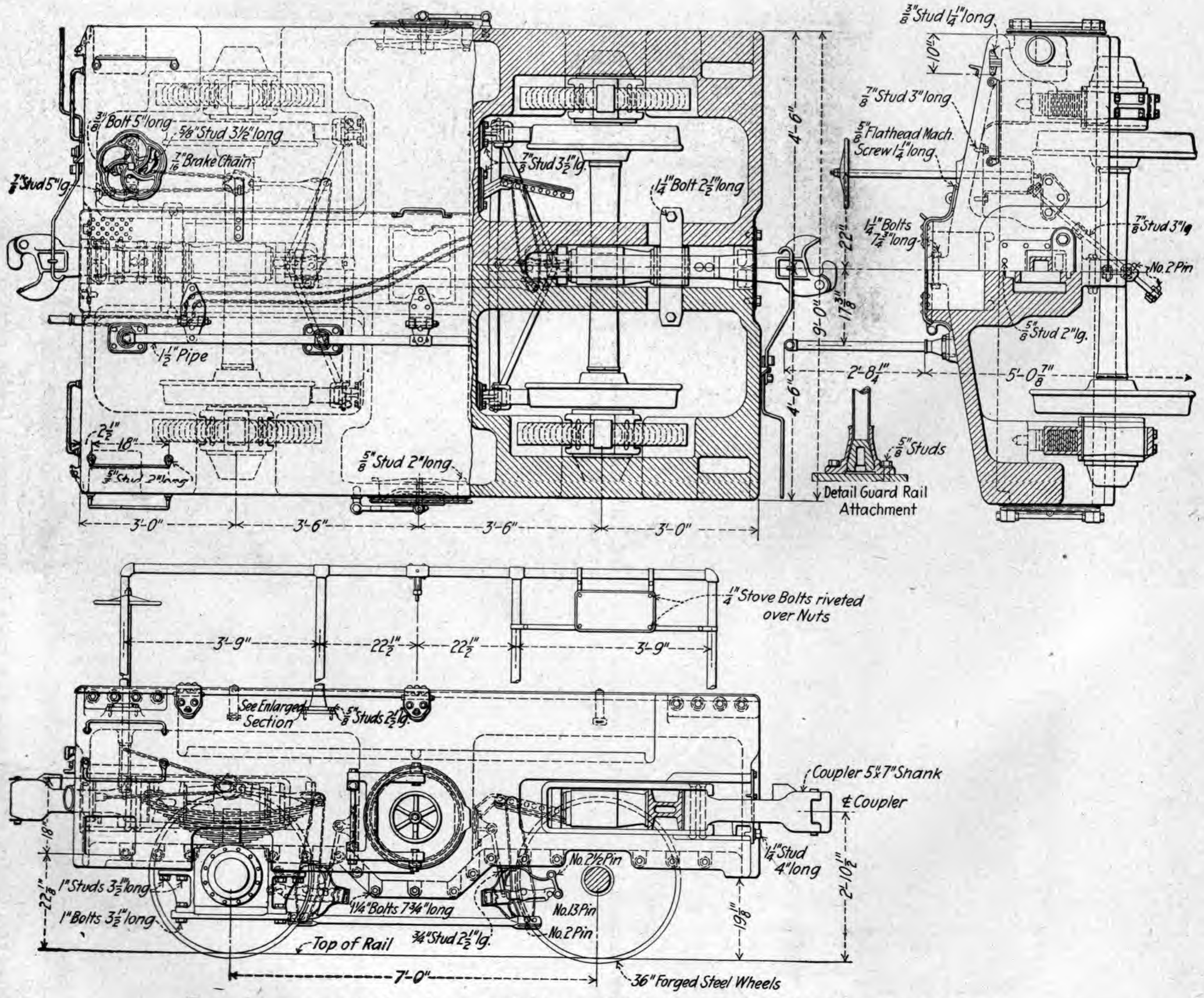
New York Central all-steel snow plow ready for road movement. Ladder, coupling bar and air hose connections are removable. Builder, Russell Snow Plow Company.



Lehigh Valley all-steel snow plow for double-track operation. Flanger is underneath just ahead of rear trucks. Builder, Russell Snow Plow Company.



Scale test weight car, 80,000 lb. Builder, American Car and Foundry Company.

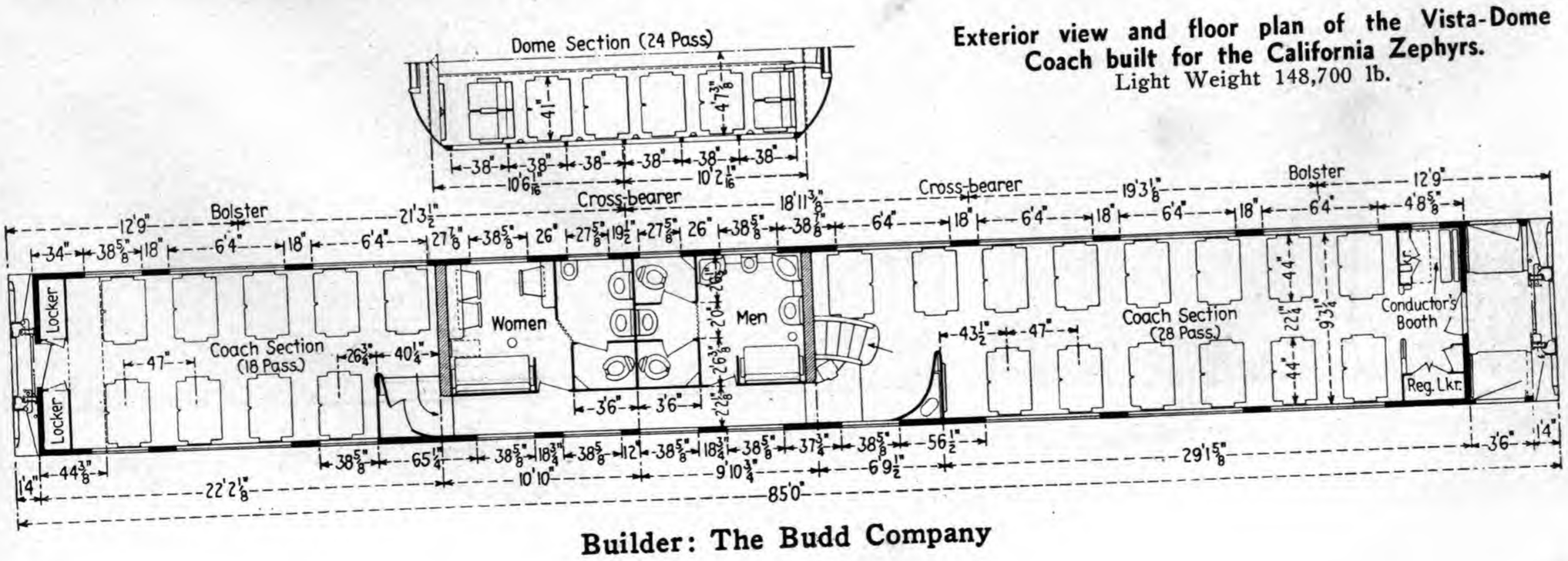


General arrangement of scale test weight car, 80,000 lb. capacity. The Pennsylvania Railroad.

Left—The Vista-Domes of the California Zephyr coaches accommodate 24 passengers.

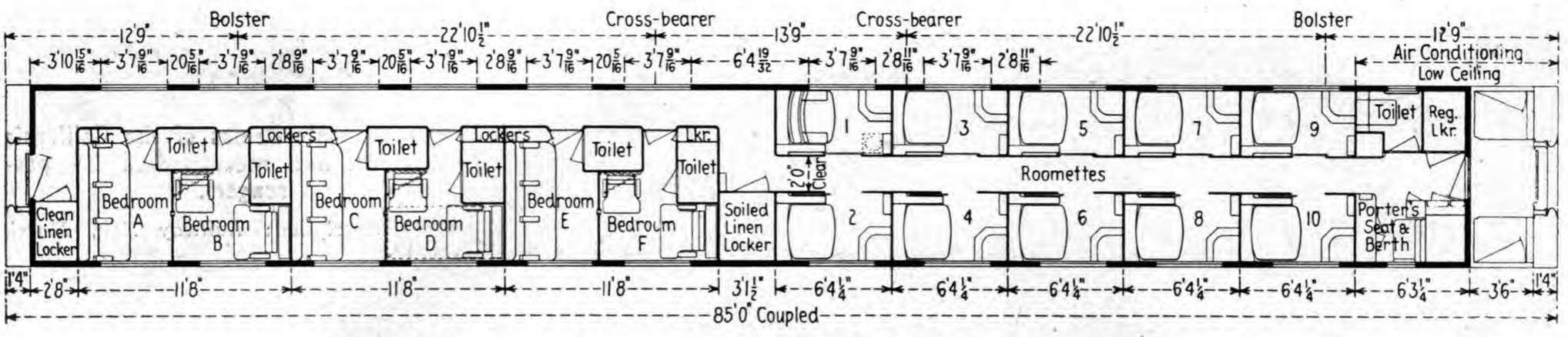
Full Description: *Railway Age,* March 26, 1949.

Below—Coach seats are equipped with padded leg rests, adjustable in height and length to suit the stature of each individual occupant.

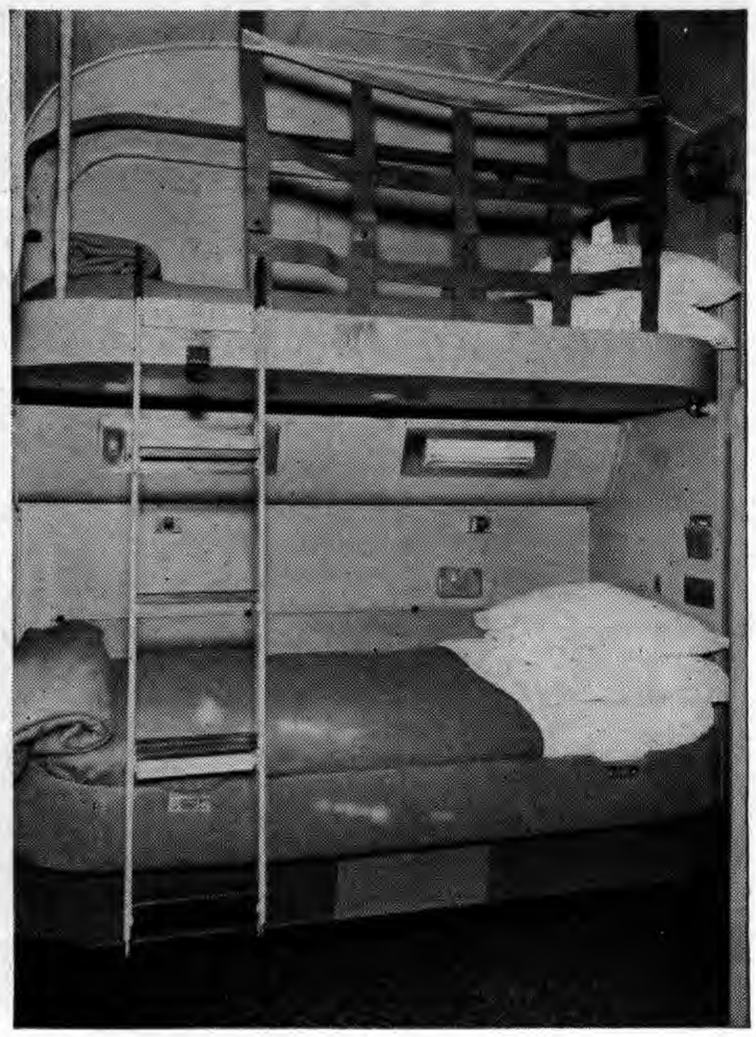


Exterior view and floor plan of the Vista-Dome Coach built for the California Zephyrs.
Light Weight 148,700 lb.

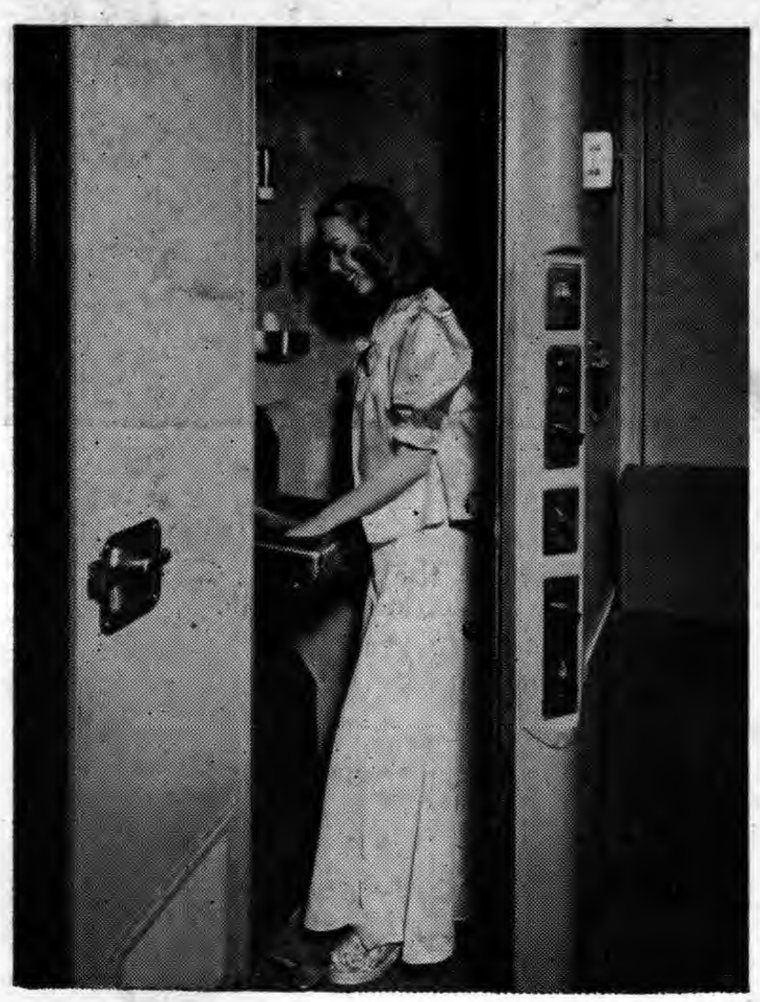
Builder: The Budd Company



The six-bedroom and 10-roomette sleeping car of the California Zephyrs.
Light Weight 142,350 lb.

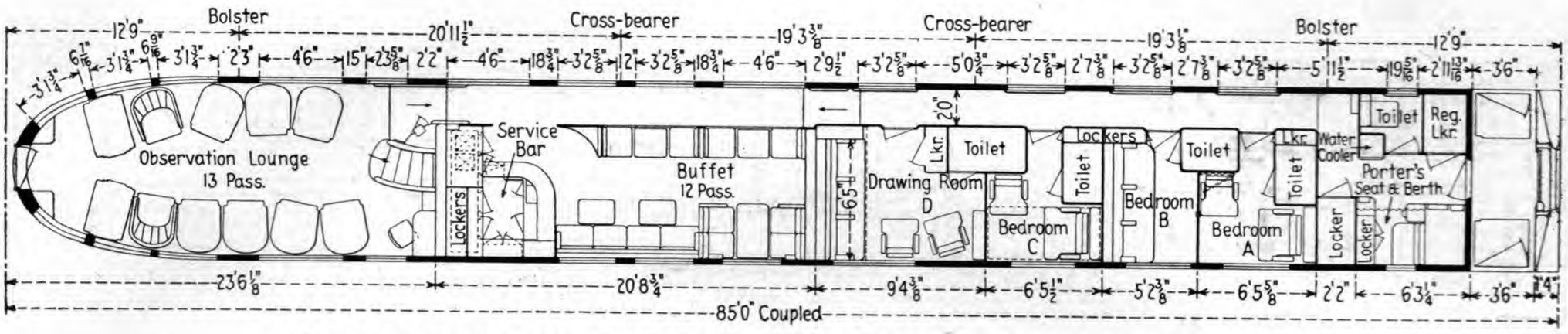


Double bedroom on a California Zephyr made up for daytime occupancy (left) and sleeping (right).



Each of the double bedrooms has its private bathroom (left). Right—Roomette on a California Zephyr sleeping car, berth made up.

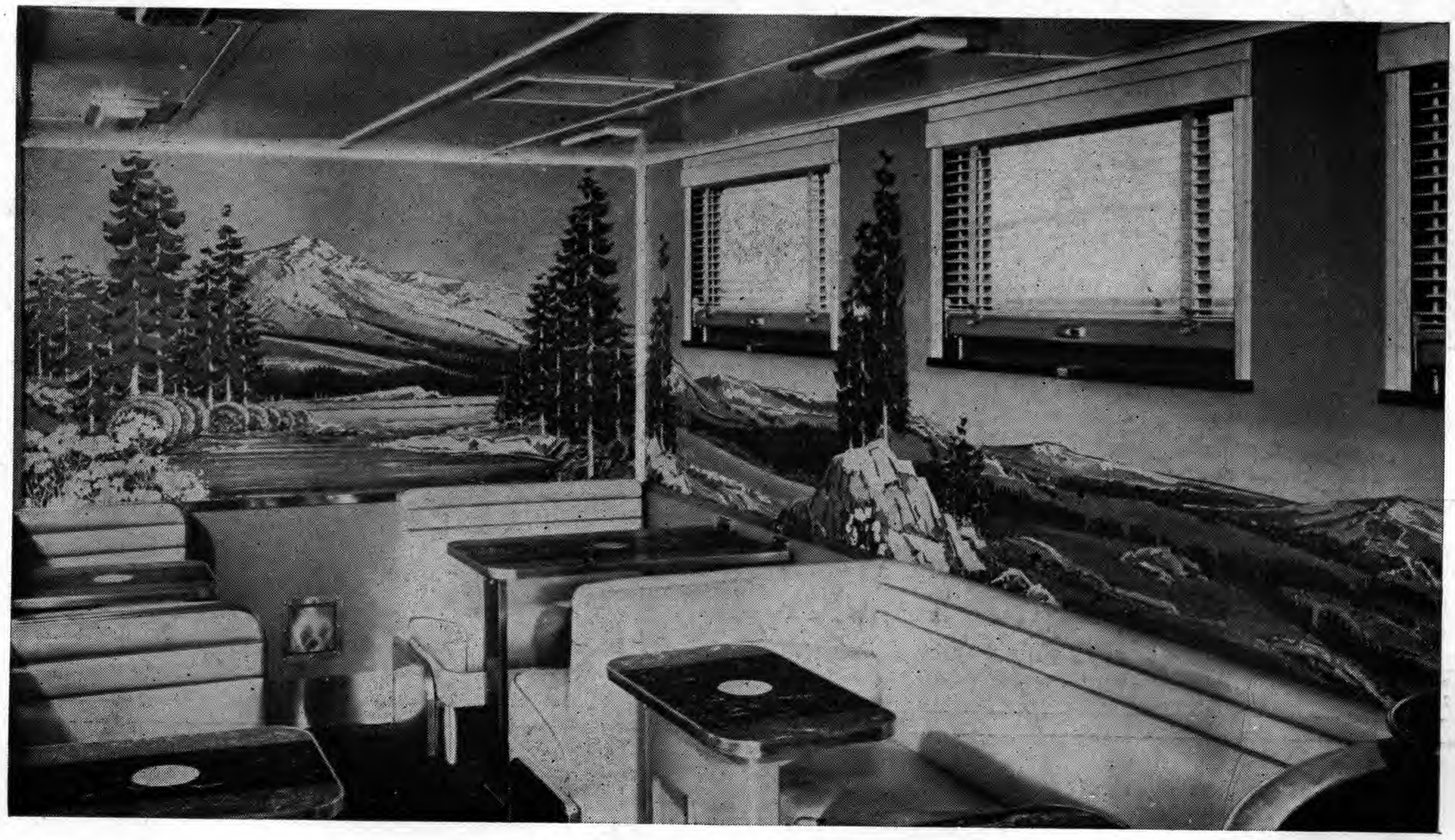
Builder: The Budd Company



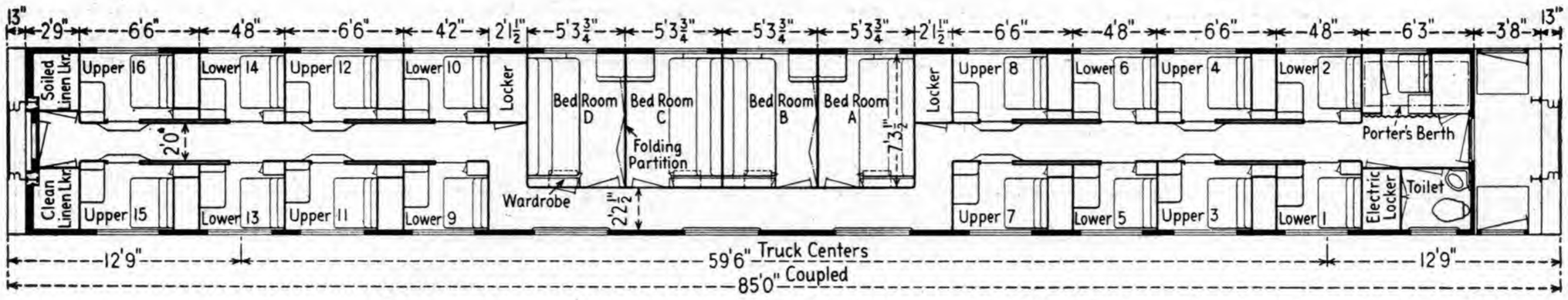
Floor plan of the California Zephyr Vista-Dome bedroom-buffet-observation car.
Light Weight 151,030 lb.

Above left—The observation lounge looking toward the rear. Right—Entrance to the Vista-Dome from the observation room.

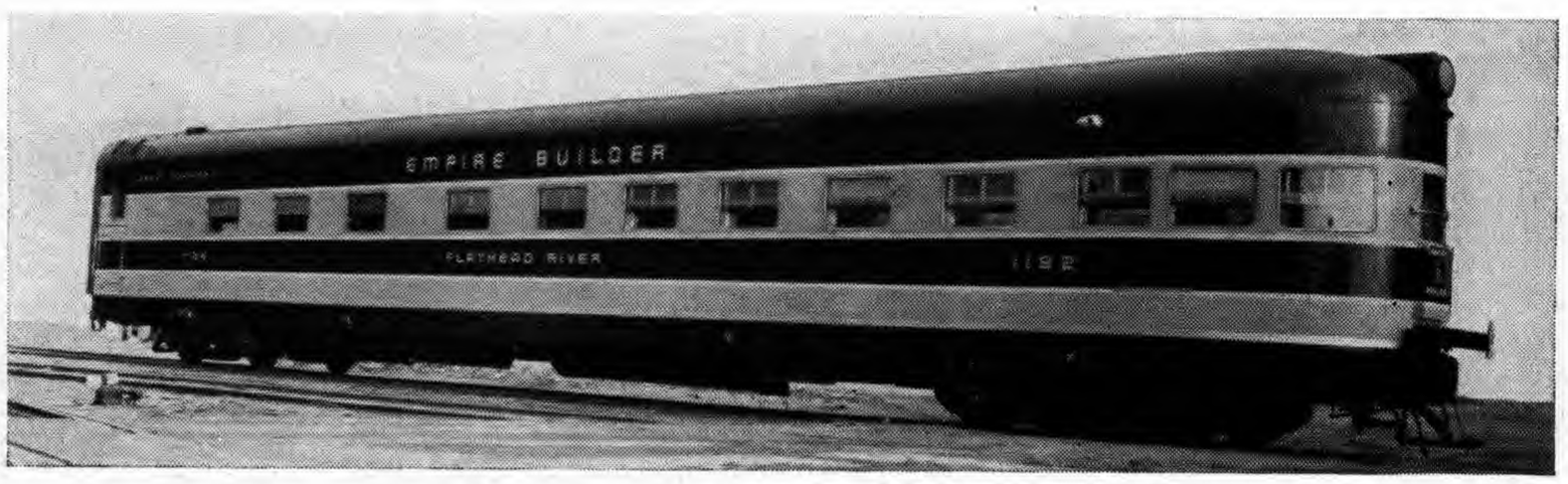
Below—The underdome buffet, cocktail lounge, having seats for 12, is richly decorated with murals of western scenery.



Builder: The Budd Company



Floor plan Great Northern sleeping car with 16 duplex roomettes and 4 bedrooms.



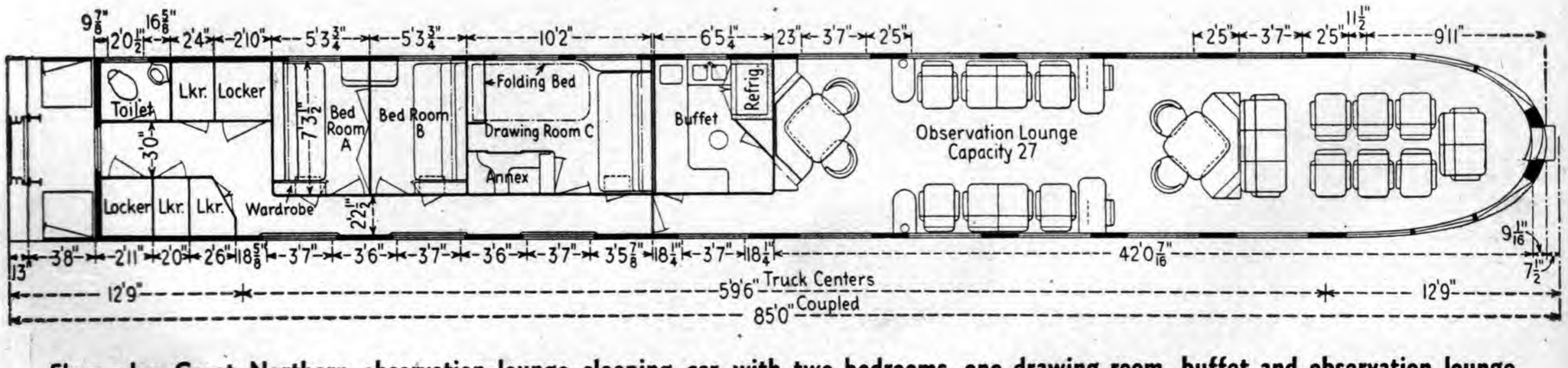
Above—Exterior view of "Empire Builder" observation-lounge sleeping car.

Left—Looking from buffet to rear end of observation-lounge.

Weights

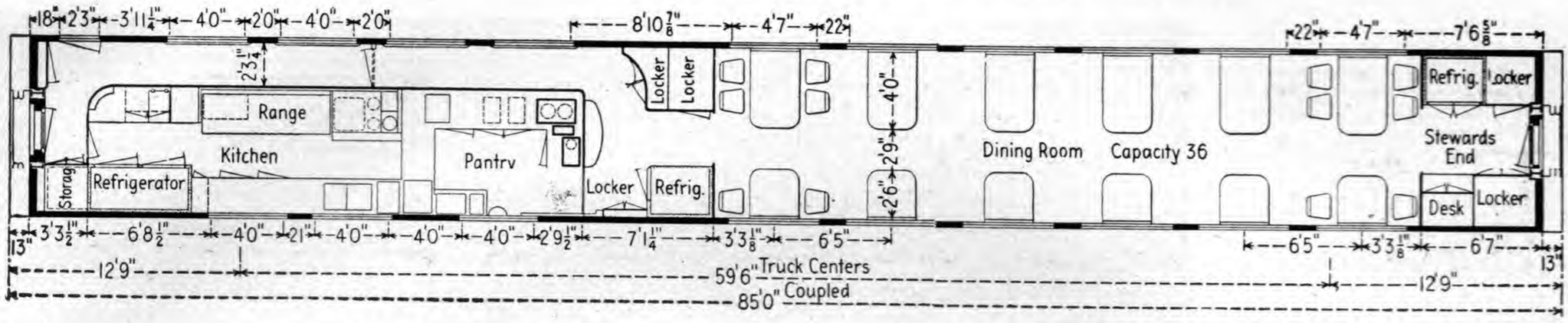
Full Sleeping Car .....137,500 lb.
Observation Sleeping Car .....122,000 lb.

Description:
Railway Age, April 12, 1947



Floor plan Great Northern observation-lounge sleeping car with two bedrooms, one drawing room, buffet and observation lounge for 27 passengers.

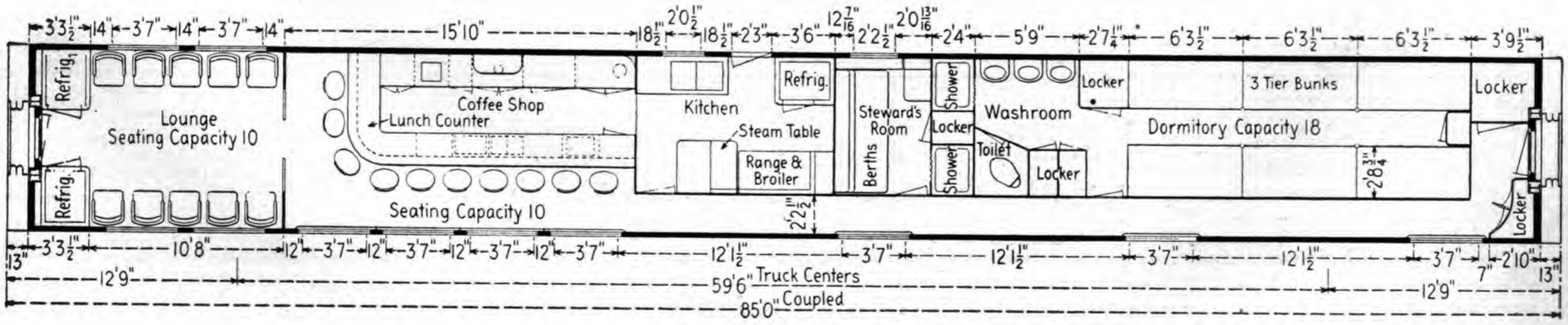
Builder, Pullman-Standard Car Manufacturing Co.



Floor plan Great Northern dining car, seating 36 persons. Weight 130,300 lb.

Left—Coffee shop lunch counter seats 10 persons.

Interior view of dining car.

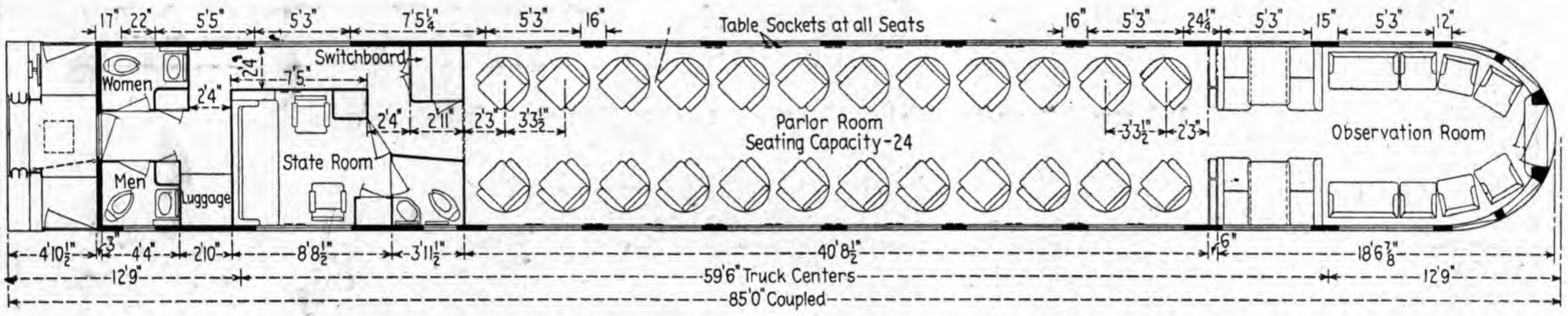


Floor plan lunch-counter lounge car with crew dormitory. Weight 128,700 lb.

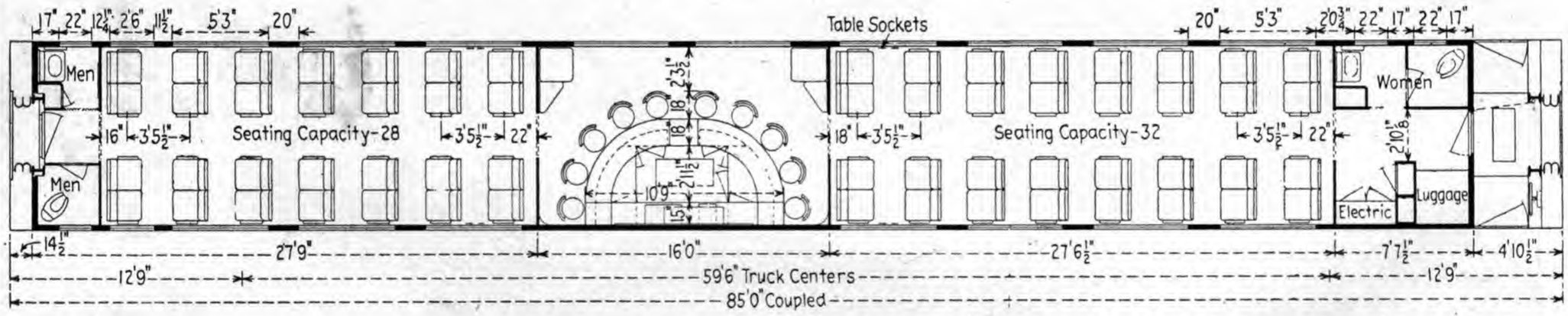
Builder, Pullman-Standard Car Manufacturing Co.

Coffee-shop coach—looking from coach section to the semi-circular counter in the center of the car.

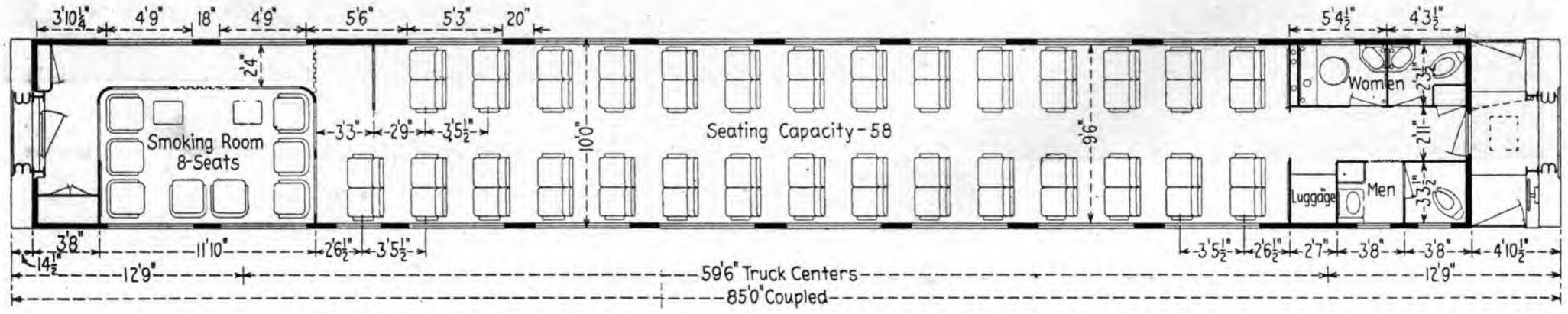
Description: *Railway Age*, December 27, 1947



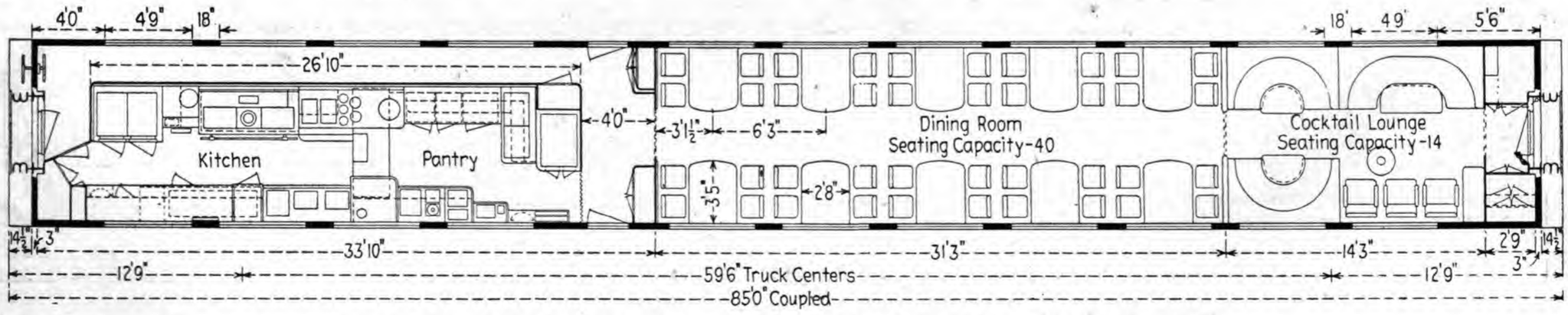
Floor plan Wabash parlor-observation car with staterooms. Light weight 129,800 lb.



Floor plan Wabash coffee-shop club coach. Light weight 133,900 lb.

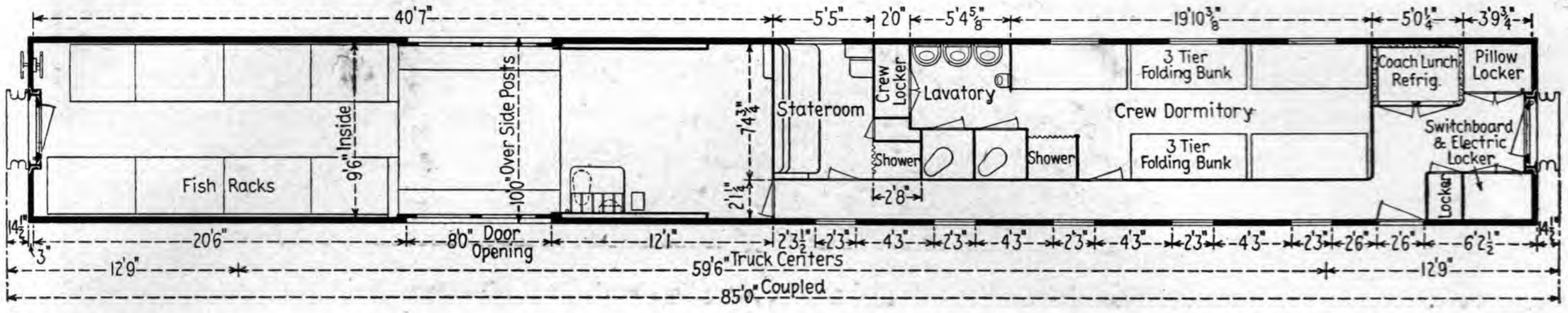


Floor plan Wabash 58-passenger coach with smoking room. Light weight 131,800 lb.

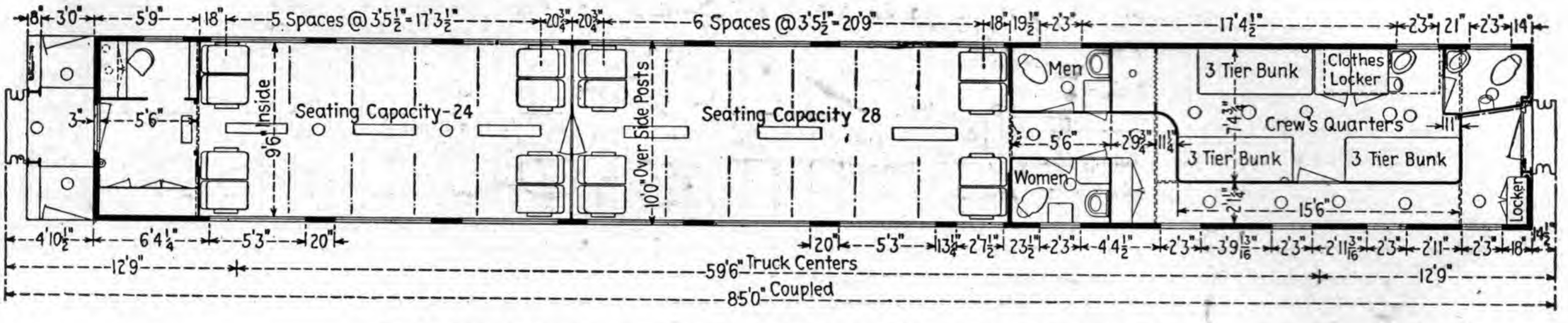


Floor plan Wabash dining car with cocktail lounge. Light weight 142,000 lb.

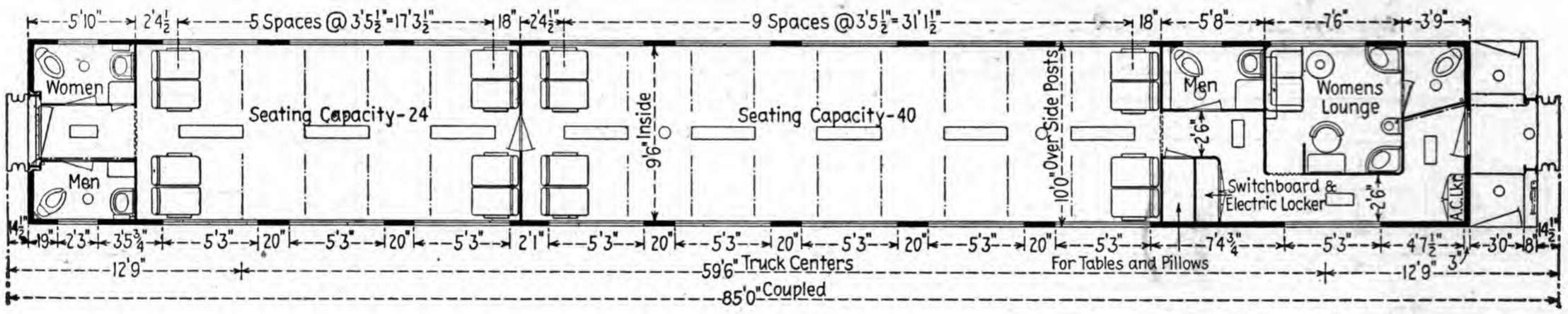
Builder, American Car and Foundry Co.



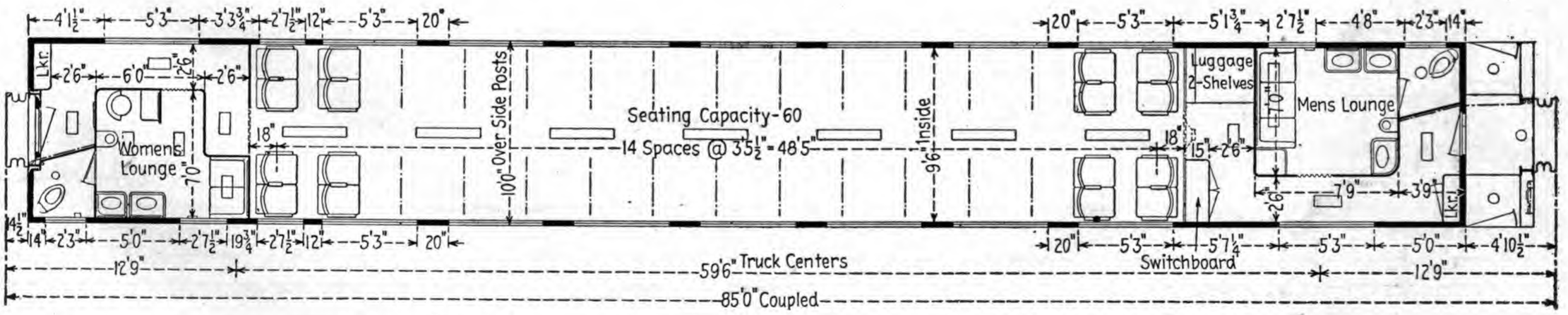
Floor plan of baggage-dormitory car—Bunks for crew of 15.



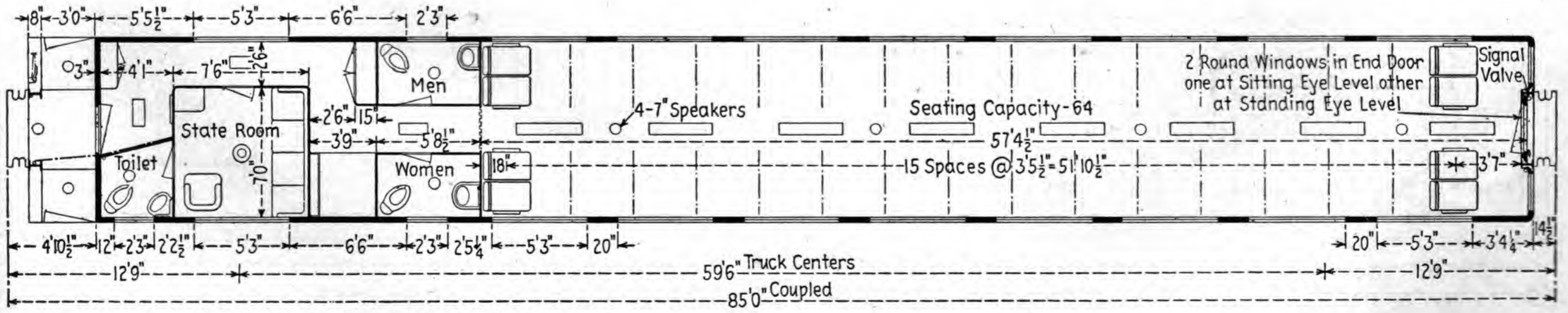
Floor plan of dormitory-coach—52 passengers and bunks for crew of nine.



Floor plan of 64-passenger de luxe divided coach.



Floor plan of 60-passenger undivided coach with lounges for men and women.

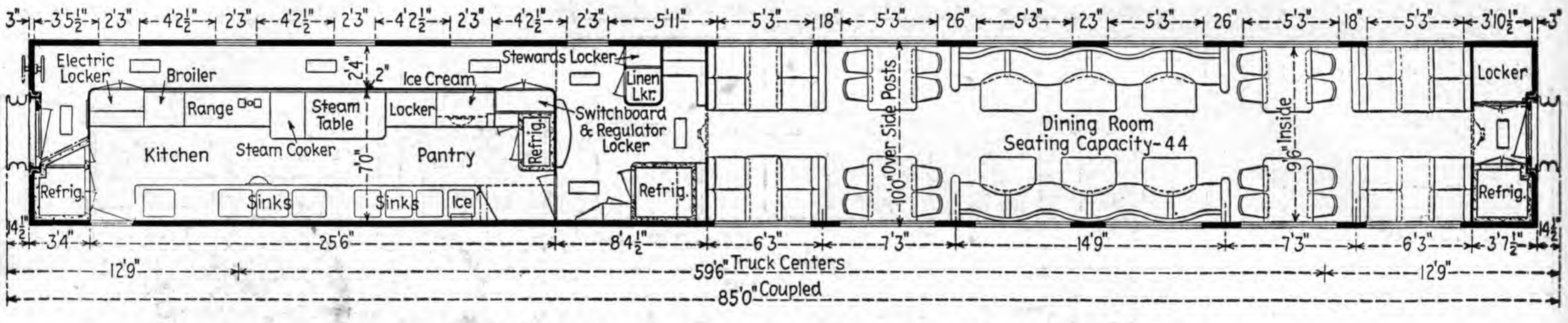


Floor plan of 64-passenger de luxe coach with stateroom and observation windows.

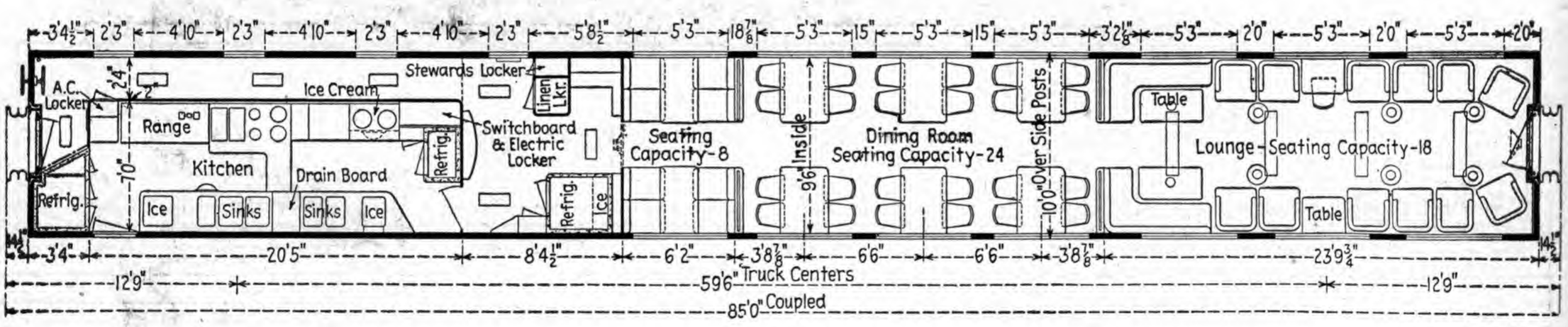
Description: *Railway Age*, August 28, 1948

Builder, American Car and Foundry Co.

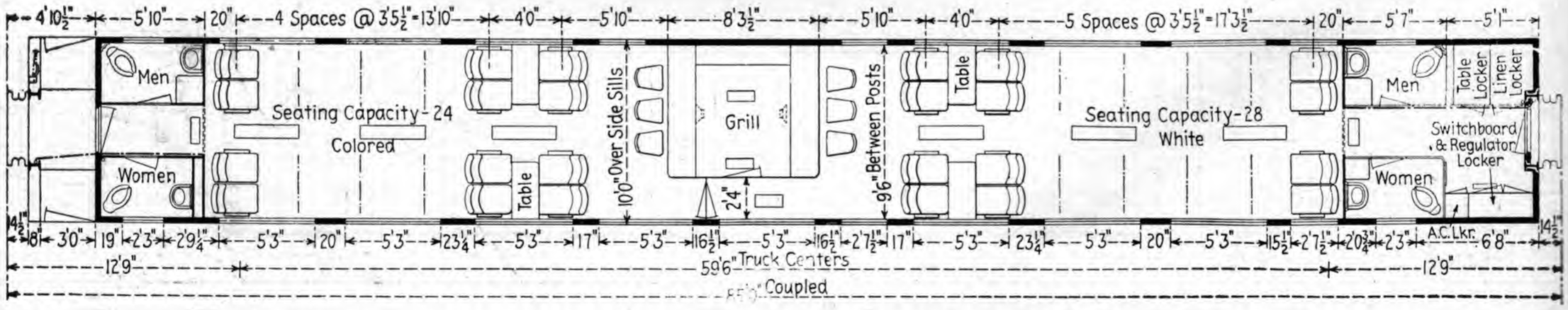
One of the Missouri Pacific "Eagle" Coaches.



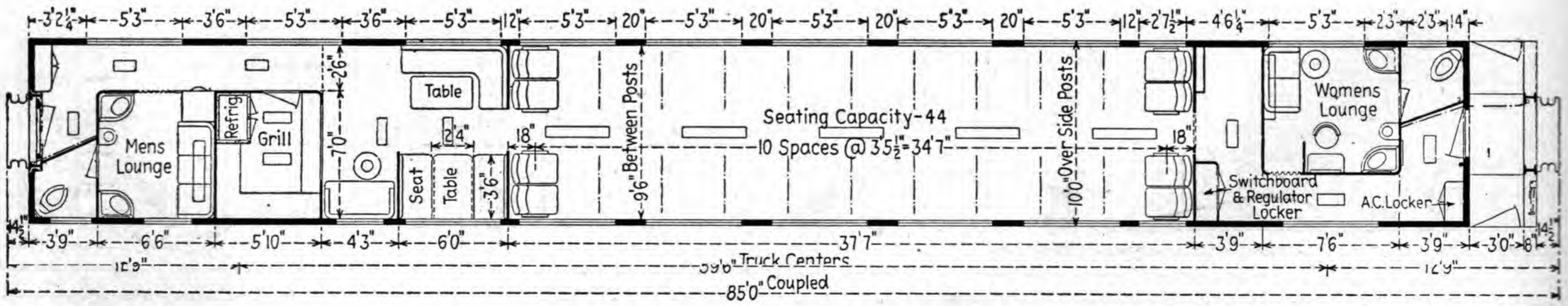
Floor plan of dining car for "Eagle" trains on Missouri Pacific and Texas & Pacific.



Floor plan of the diner-lounge car.


Men
Women
Seating Capacity-24 Colored
Table
Over Side Sills
Grill
Between Posts
Seating Capacity-28 White
Table Locker
Linen Locker
Switchboard & Regulator Locker
A.C. Lkr.
4'10½" 5'10" 20" 4 Spaces @ 3'5½"=13'10" 4'0" 5'10" 8'3½" 5'10" 4'0" 5 Spaces @ 3'5½"=17'3½" 20" 5'7" 5'1"
14½" 8" 3'0" 19" 2'3" 2'9¼" 5'3" 20" 5'3" 23¼" 5'3" 17" 5'3" 16½" 5'3" 16½" 2'7½" 17" 5'3" 23¼" 5'3" 20" 5'3" 15½" 2'7½" 20¾" 2'3" 6'8" 14½"
12'9" 59'6" Truck Centers 12'9"
85'0" Coupled

Floor plan of the divided grill coach with double counter service.


Mens Lounge
Refrig.
Grill
Table
Seat
Between Posts
Seating Capacity-44
10 Spaces @ 3'5½"=34'7"
Over Side Posts
Womens Lounge
Switchboard & Regulator Locker
A.C. Locker
3'2¼" 5'3" 3'6" 5'3" 3'6" 5'3" 12" 5'3" 20" 5'3" 20" 5'3" 20" 5'3" 20" 5'3" 12" 2'7½" 4'6¼" 5'3" 2'3" 2'3" 14"
14½" 3'9" 6'6" 5'10" 4'3" 6'0" 37'7" 3'9" 7'6" 3'9" 3'0" 6" 14½"
12'9" 59'6" Truck Centers 12'9"
85'0" Coupled

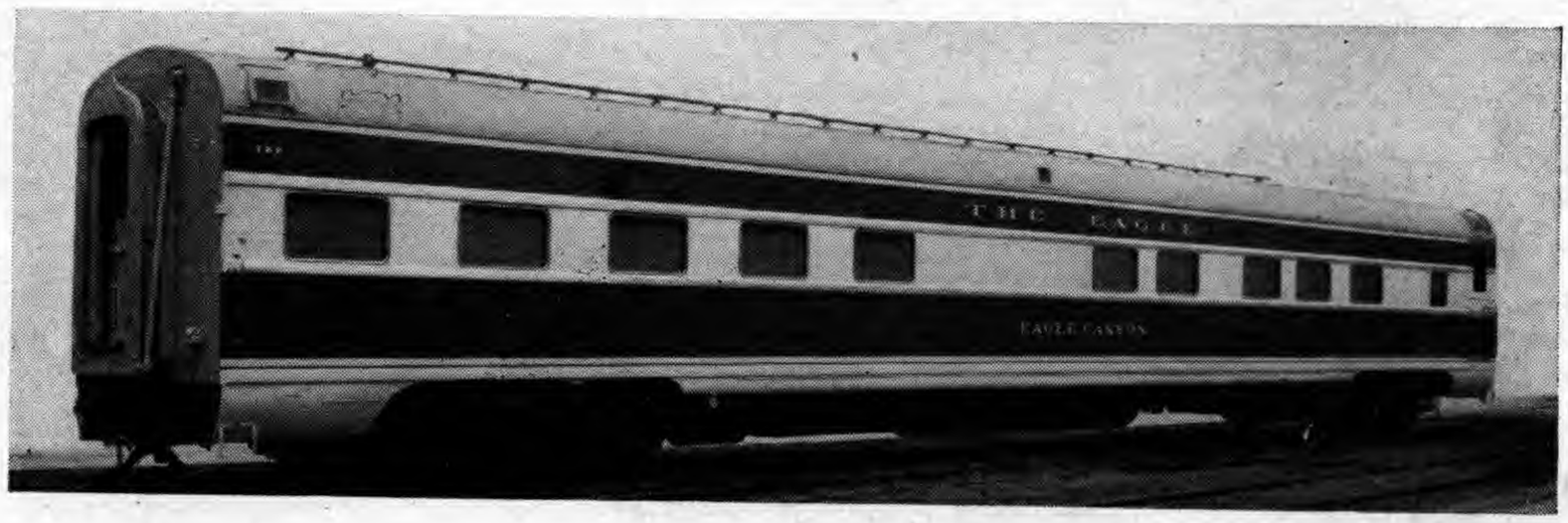
Floor plan of the 44-passenger grill coach with lounges for men and women.

Description: *Railway Age,* September 18, 1948

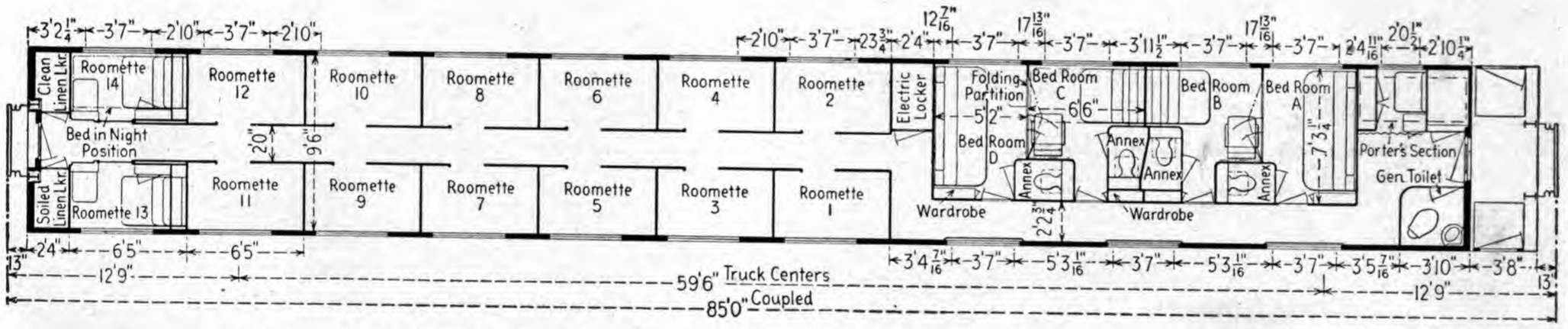
Builder, American Car and Foundry Co.

Interior view of lounge section in Missouri Pacific and Texas & Pacific bedroom-lounge car having floor plan shown at bottom of page

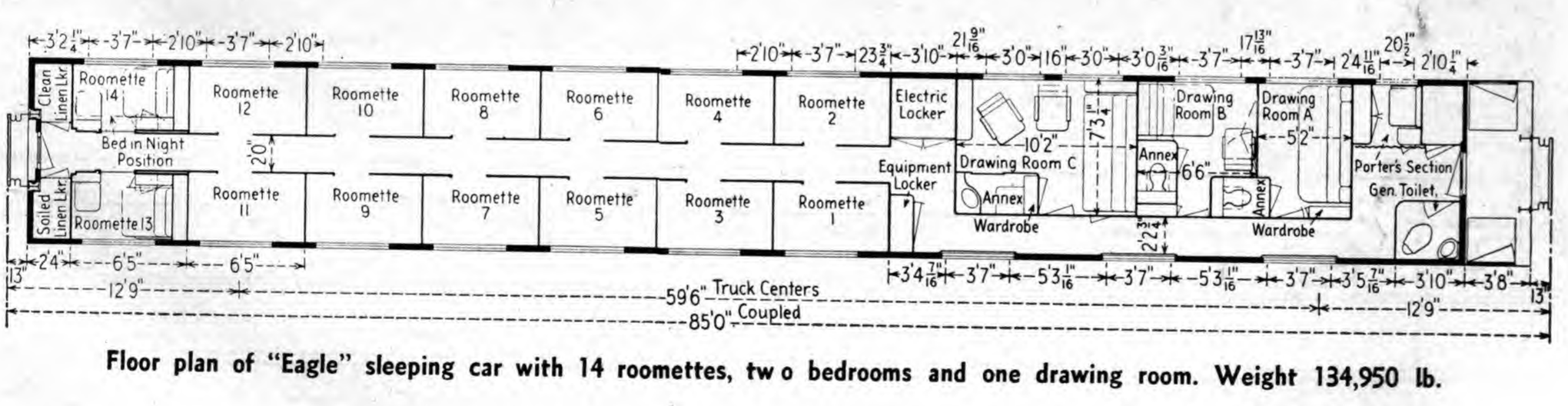
Description: *Railway Age*, August 21, 1948



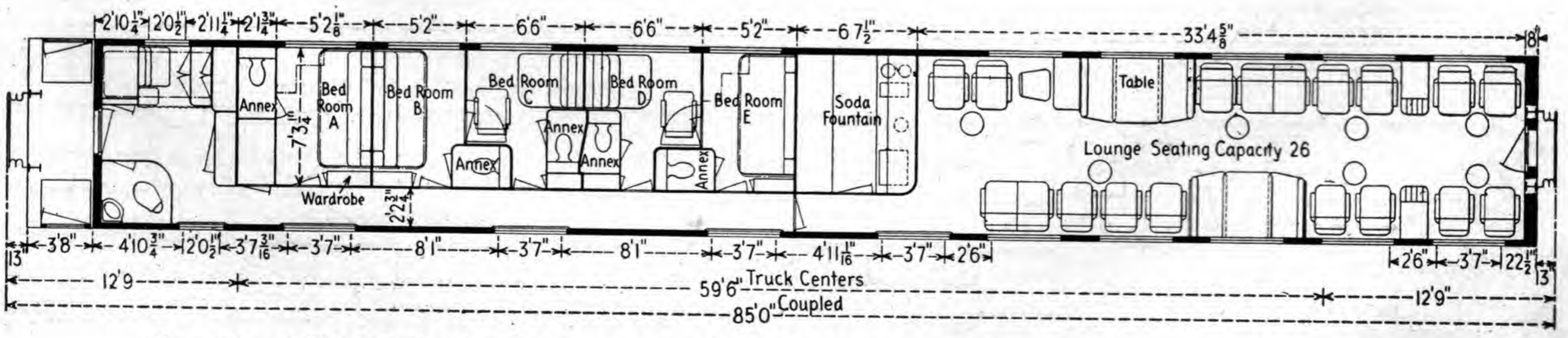
Exterior of bedroom-lounge car for "Eagle" trains.



Floor plan of "Eagle" sleeping car with 14 roomettes and four bedrooms. Weight 134,800 lb.



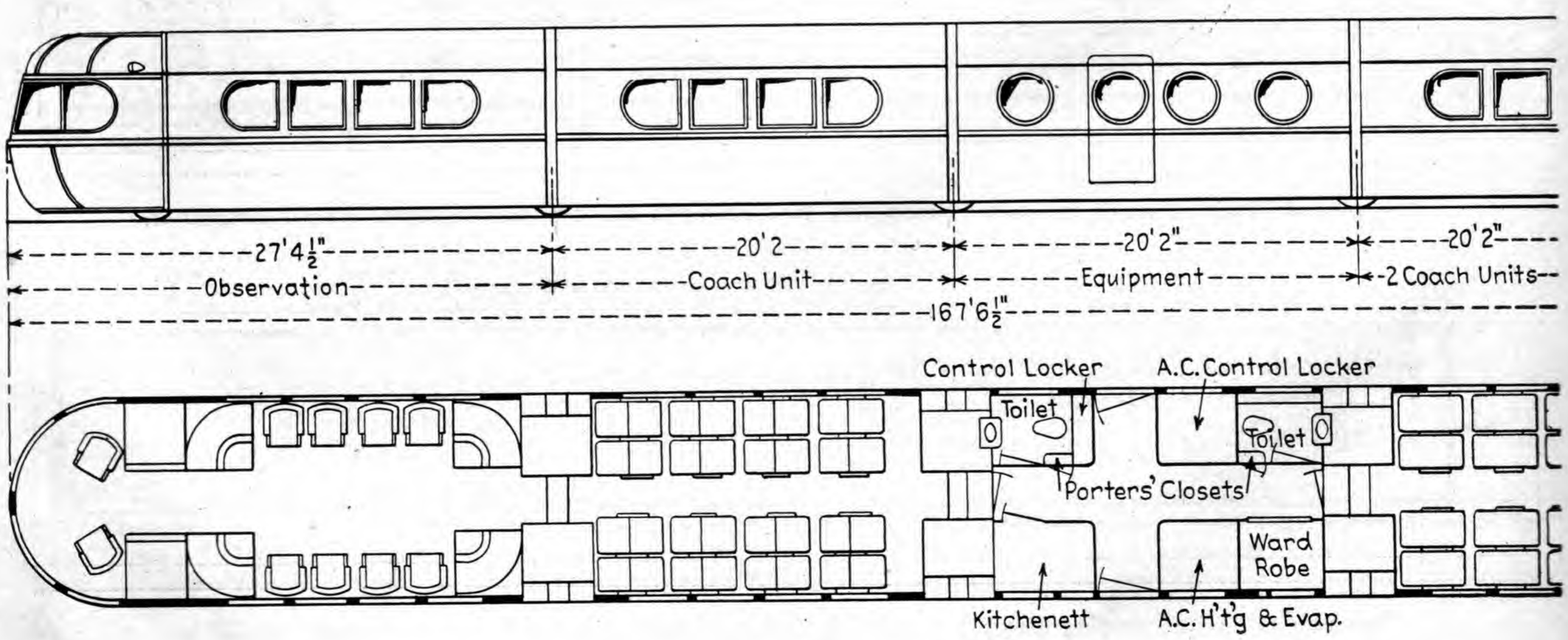
Floor plan of "Eagle" sleeping car with 14 roomettes, two bedrooms and one drawing room. Weight 134,950 lb.



Floor plan of "Eagle" sleeping lounge car with five bedrooms and soda fountain lounge. Weight 125,600 lb.

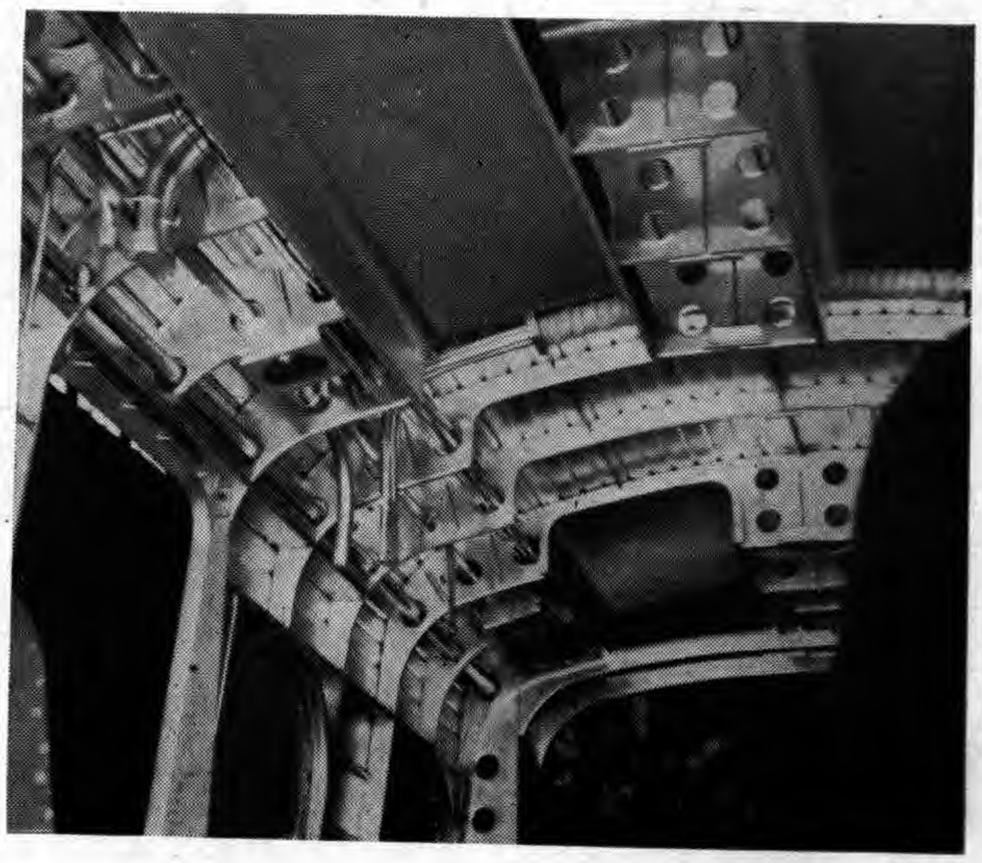
Builder, Pullman-Standard Car Manufacturing Co.

Exterior of train and interior of coach and observation sec tion of the American Car & Foundry Company's "Talgo" train.



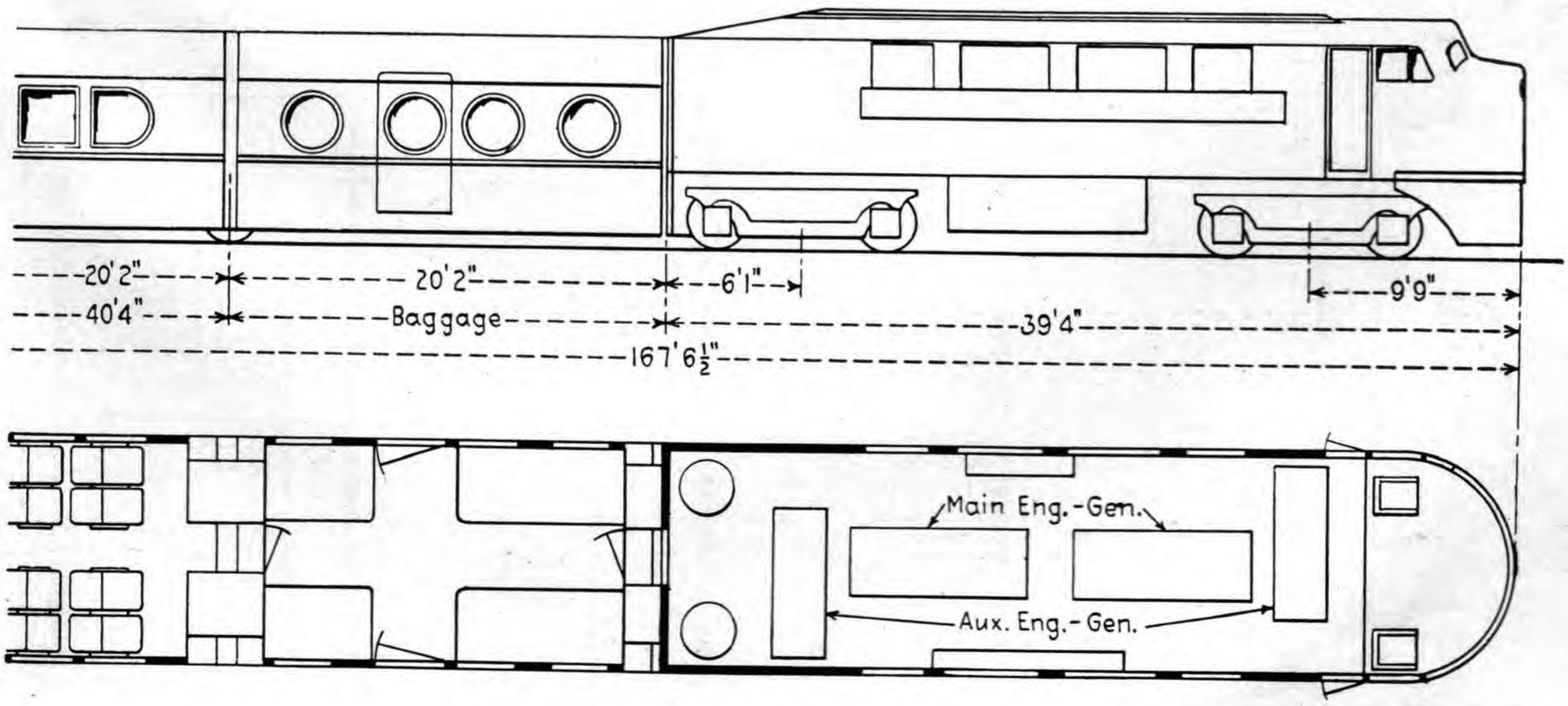
Builder, American Car & Foundry Co.

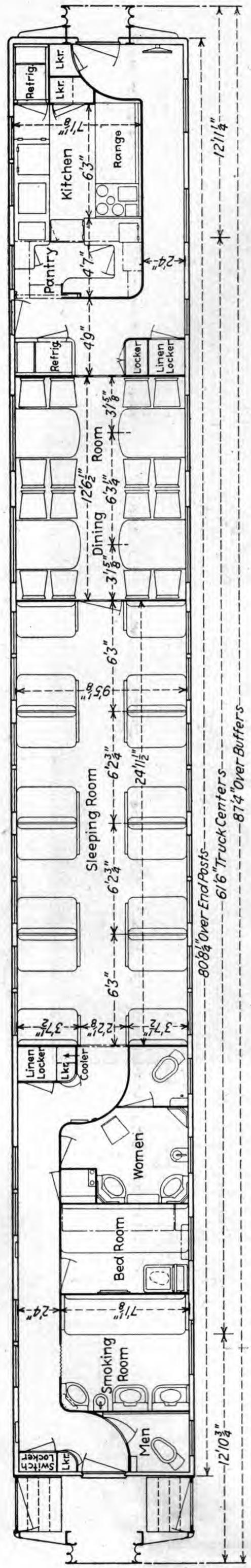
Above left and right—End construction of the units of the train permits coupling on a simple jaw-and-pin arrangement. Rubber diaphragms are applied between units and closed by zippers.



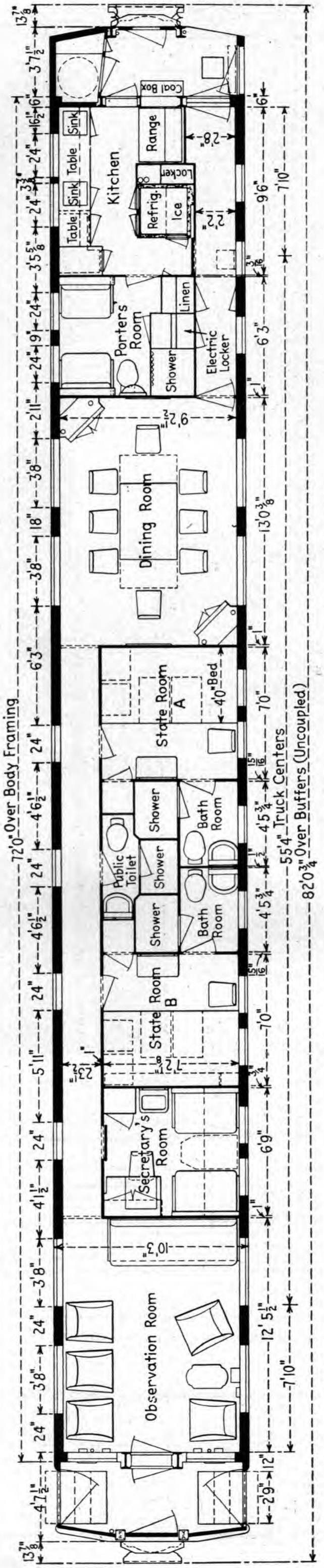
Right—Framing details of the aluminum-alloy car structure.

Below and facing page—Side elevation and floor plan of the A.C.F.-built locomotive and articulated car units.

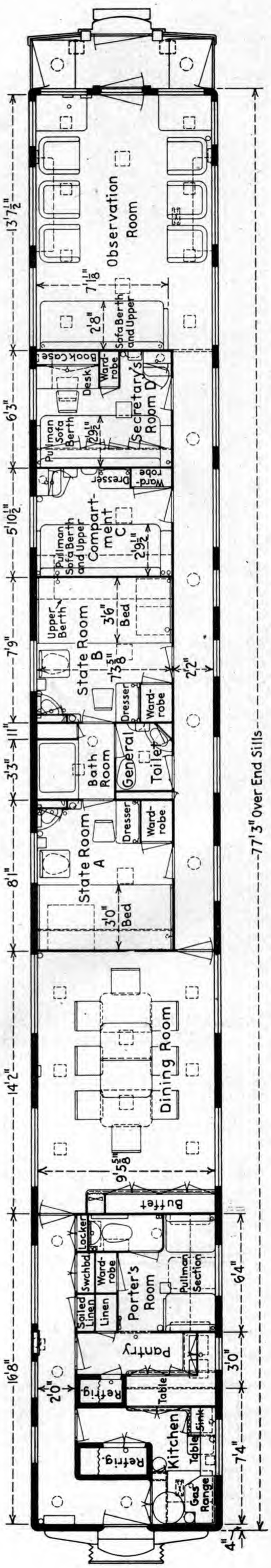




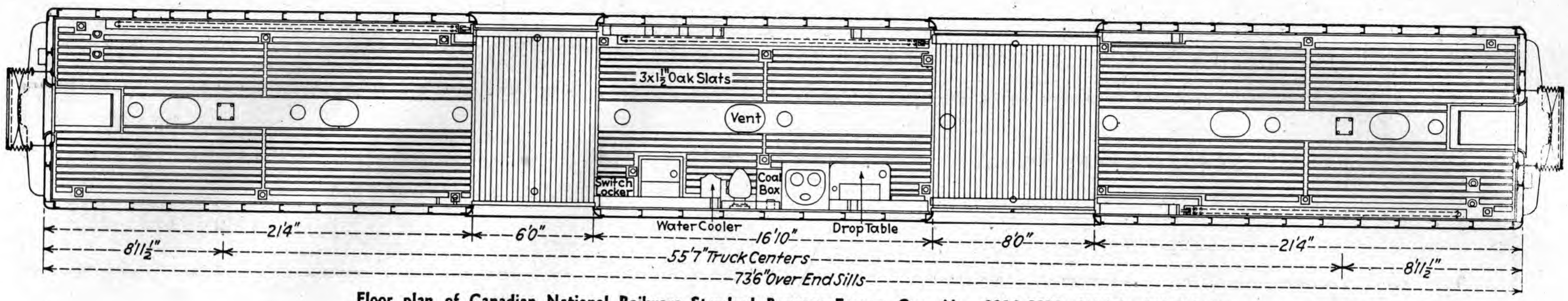
Floor plan Canadian National Railways Buffet Sleeping Car. Weight 156,000 lb.



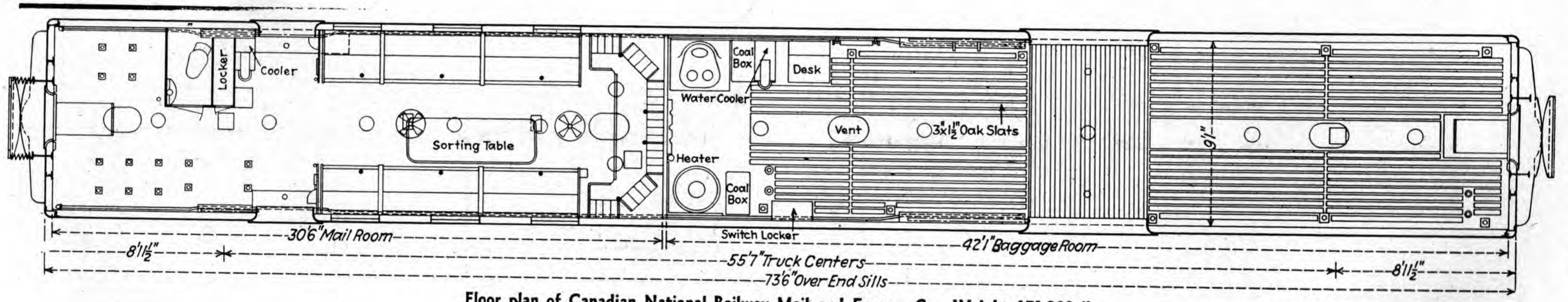
Floor plan, St. Louis-San Francisco Business Car with good kitchen arrangement.



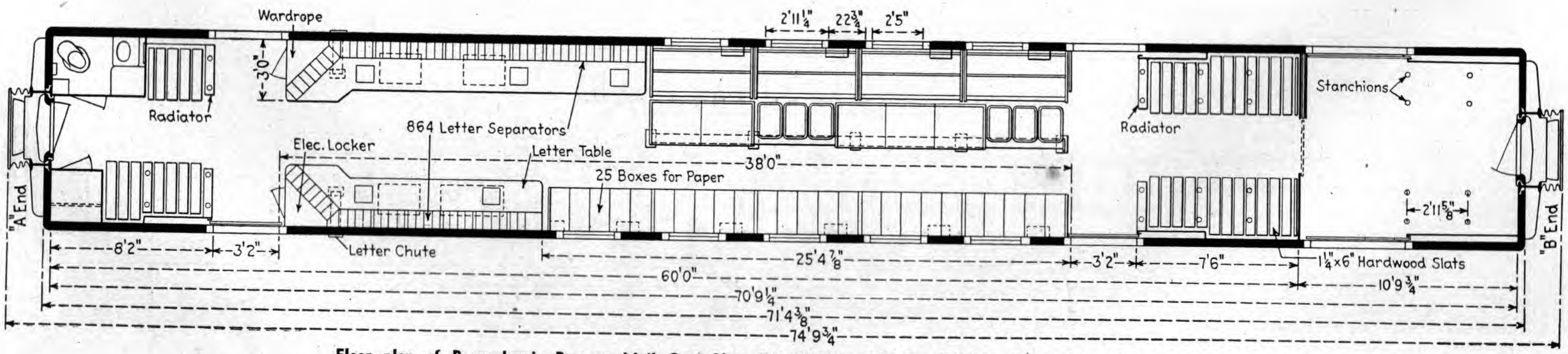
Floor plan, Northern Pacific Business Car No. 2



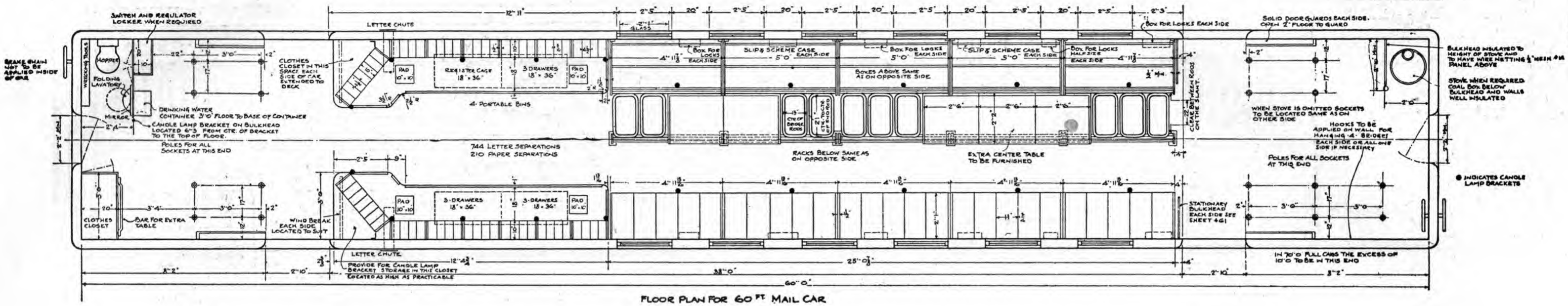
Floor plan of Canadian National Railways Standard Baggage-Express Cars, Nos. 8814-8828. Weight 143,600 lb.



Floor plan of Canadian National Railway Mail and Express Car. Weight 151,300 lb.

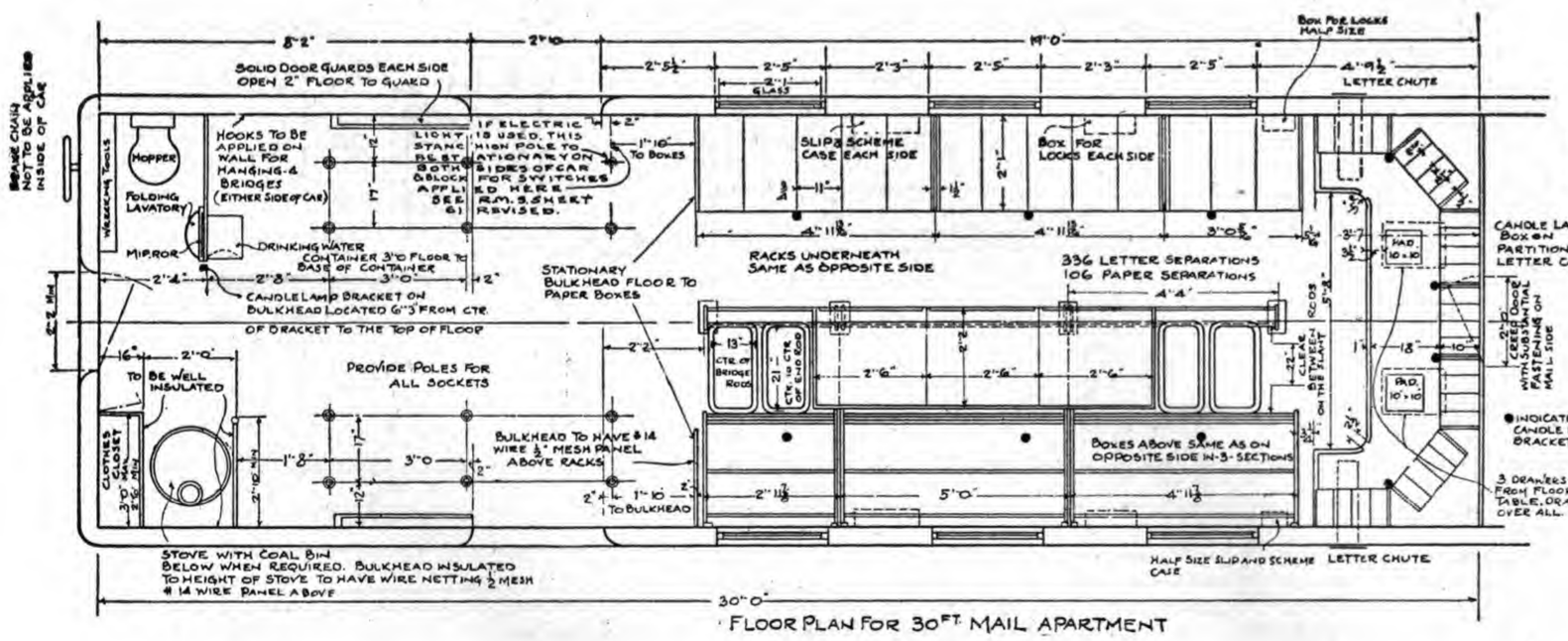


Floor plan of Pennsylvania Baggage-Mail Car, Class BM-70-NA. Weight 135,200 lb. Builder, Railroad Shops.

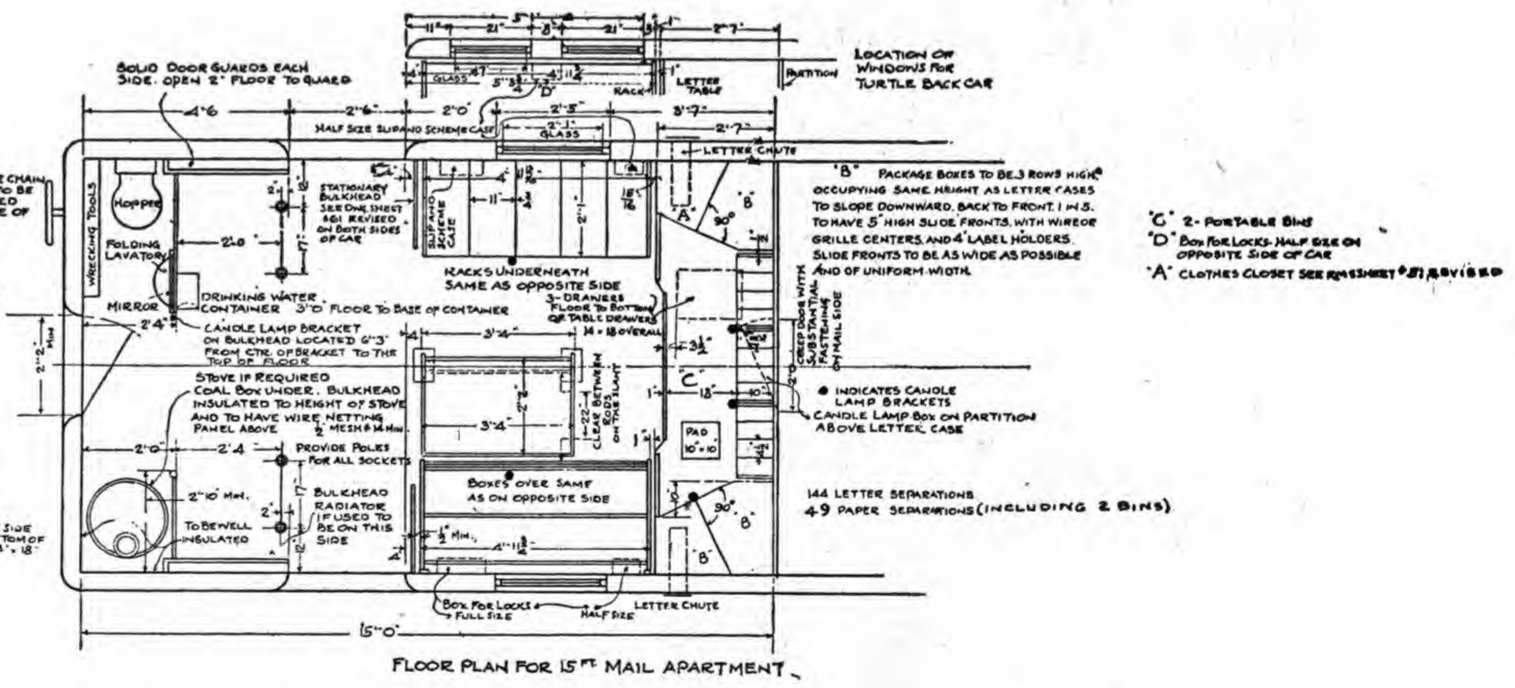

SWITCH AND REGULATOR LOCKER WHEN REQUIRED
LETTER CHUTE
SOLID DOOR GUARDS EACH SIDE. OPEN 2" FLOOR TO GUARD
BRAKE CHAIN NOT TO BE APPLIED INSIDE OF CAR
HOPPER
FOLDING LAVATORY
MIRROR
DRINKING WATER CONTAINER 3'-0" FLOOR TO BASE OF CONTAINER
CANDLE LAMP BRACKET ON BULKHEAD LOCATED 6'-3" FROM CTR. OF BRACKET TO THE TOP OF FLOOR.
POLES FOR ALL SOCKETS AT THIS END
CLOTHES CLOSET IN THIS SPACE EACH SIDE OF CAR EXTENDED TO DECK
REGISTER CAGE 18" x 36"
3 DRAWERS 18" x 36"
PAD 10" x 10"
4 PORTABLE BINS
744 LETTER SEPARATIONS 210 PAPER SEPARATIONS
BOX FOR LOCKS EACH SIDE
SLIP & SCHEME CASE 5'-0" EACH SIDE
BOXES ABOVE SAME AS ON OPPOSITE SIDE
RACKS BELOW SAME AS ON OPPOSITE SIDE
EXTRA CENTER TABLE TO BE FURNISHED
BOX FOR LOCKS HALF SIZE
BOX FOR LOCKS EACH SIDE
BULKHEAD INSULATED TO HEIGHT OF STOVE AND TO HAVE WIRE NETTING ½" MESH #14 PANEL ABOVE
STOVE WHEN REQUIRED. COAL BOX BELOW BULKHEAD AND WALLS WELL INSULATED
WHEN STOVE IS OMITTED SOCKETS TO BE LOCATED SAME AS ON OTHER SIDE
HOOKS TO BE APPLIED ON WALL FOR HANGING 4 BRIDGES EACH SIDE OR ALL ONE SIDE IF NECESSARY
POLES FOR ALL SOCKETS AT THIS END
● INDICATES CANDLE LAMP BRACKETS
CLOTHES CLOSET
BAR FOR EXTRA TABLE
WIND BREAK EACH SIDE LOCATED TO SUIT
3 DRAWERS 18" x 36"
STATIONARY BULKHEAD EACH SIDE SEE SHEET 461
PROVIDE FOR CANDLE LAMP BRACKET STORAGE IN THIS CLOSET LOCATED AS HIGH AS PRACTICABLE
IN 70'-0 PULL CARS THE EXCESS OF 10'-0 TO BE IN THIS END
8'-2"
2'-10"
38'-0"
25'-0 3/8"
2'-10"
8'-2"
60'-0"

FLOOR PLAN FOR 60 FT MAIL CAR

Floor plan of 60-ft. Full Mail Car, United States Railway Mail Service Drawing, Sheet R.


SOLID DOOR GUARDS EACH SIDE OPEN 2" FLOOR TO GUARD
BRAKE CHAIN NOT TO BE APPLIED INSIDE OF CAR
HOOKS TO BE APPLIED ON WALL FOR HANGING 4 BRIDGES (EITHER SIDE OF CAR)
IF ELECTRIC IS USED, THIS STANCHION TO BE STATIONARY ON BOTH SIDES OF CAR AND BLOCK APPLIED HERE FOR SWITCHES SEE RPO. 35 SHEET REVISED.
BOX FOR LOCKS HALF SIZE
SLIP & SCHEME CASE EACH SIDE
BOX FOR LOCKS EACH SIDE
LETTER CHUTE
HOPPER
FOLDING LAVATORY
MIRROR
DRINKING WATER CONTAINER 3'-0" FLOOR TO BASE OF CONTAINER
CANDLE LAMP BRACKET ON BULKHEAD LOCATED 6'-3" FROM CTR. OF BRACKET TO THE TOP OF FLOOR
STATIONARY BULKHEAD FLOOR TO PAPER BOXES
RACKS UNDERNEATH SAME AS OPPOSITE SIDE
336 LETTER SEPARATIONS 106 PAPER SEPARATIONS
PROVIDE POLES FOR ALL SOCKETS
BULKHEAD TO HAVE #14 WIRE ½" MESH PANEL ABOVE RACKS
BOXES ABOVE SAME AS ON OPPOSITE SIDE IN 5 SECTIONS
CANDLE LAMP BRACKET ABOVE LETTER CASE
● INDICATES CANDLE LAMP BRACKETS
3 DRAWERS EACH SIDE FROM FLOOR TO BOTTOM OF TABLE, DRAWERS 18" x 18" OVER ALL
STOVE WITH COAL BIN BELOW WHEN REQUIRED. BULKHEAD INSULATED TO HEIGHT OF STOVE TO HAVE WIRE NETTING ½ MESH #14 WIRE PANEL ABOVE
HALF SIZE SLIP AND SCHEME CASE
LETTER CHUTE
8'-2"
2'-10"
14'-0"
30'-0"

FLOOR PLAN FOR 30 FT MAIL APARTMENT

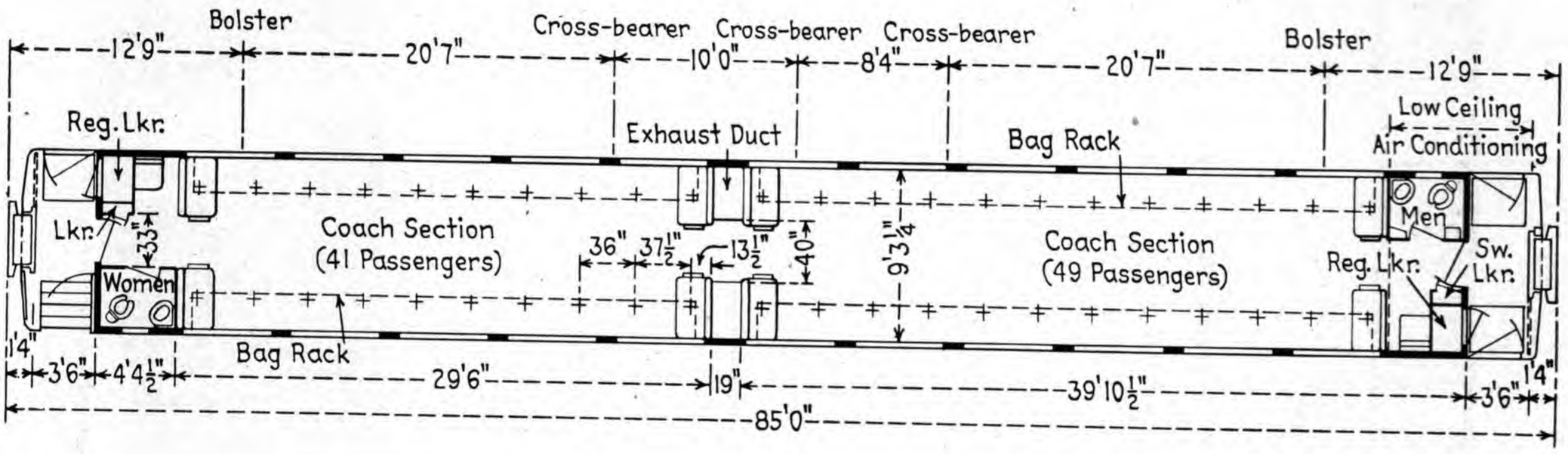

SOLID DOOR GUARDS EACH SIDE. OPEN 2" FLOOR TO GUARD
LOCATION OF WINDOWS FOR TURTLE BACK CAR
PARTITION
BRAKE CHAIN NOT TO BE APPLIED INSIDE OF CAR
HOPPER
FOLDING LAVATORY
MIRROR
DRINKING WATER CONTAINER 3'-0" FLOOR TO BASE OF CONTAINER
CANDLE LAMP BRACKET ON BULKHEAD LOCATED 6'-3" FROM CTR. OF BRACKET TO THE TOP OF FLOOR
STOVE IF REQUIRED COAL BOX UNDER. BULKHEAD INSULATED TO HEIGHT OF STOVE AND TO HAVE WIRE NETTING ½ MESH #14 WIRE PANEL ABOVE
PROVIDE POLES FOR ALL SOCKETS
BULKHEAD RADIATOR IF USED TO BE ON THIS SIDE
TO BE WELL INSULATED
STATIONARY BULKHEAD SEE DWG. SHEET 461 REVISED ON BOTH SIDES OF CAR
RACKS UNDERNEATH SAME AS OPPOSITE SIDE
3 DRAWERS FROM TOP OF TABLE DRAWERS 14 x 18 OVERALL
BOXES OVER SAME AS ON OPPOSITE SIDE
● INDICATES CANDLE LAMP BRACKETS
CANDLE LAMP BOX ON PARTITION ABOVE LETTER CASE
144 LETTER SEPARATIONS 49 PAPER SEPARATIONS (INCLUDING 2 BINS)
"B" PACKAGE BOXES TO BE 3 ROWS HIGH OCCUPYING SAME HEIGHT AS LETTER CASES TO SLOPE DOWNWARD, BACK TO FRONT 1 IN 5. TO HAVE 5" HIGH SLIDE FRONTS WITH WIREOR GRILLE CENTERS AND 4" LABEL HOLDERS. SLIDE FRONTS TO BE AS WIDE AS POSSIBLE AND OF UNIFORM WIDTH.
"C" 2 - PORTABLE BINS
"D" BOX FOR LOCKS - HALF SIZE ON OPPOSITE SIDE OF CAR
"A" CLOTHES CLOSET SEE RPO SHEET 461 REVISED
BOX FOR LOCKS FULL SIZE
HALF SIZE
LETTER CHUTE
15'-0"

FLOOR PLAN FOR 15 FT MAIL APARTMENT

Floor plans of 30-ft. and 15-ft. Mail Compartments for Combination Baggage and Mail or Passenger and Mail Cars, Railway Mail Service Drawing, Sheet S.

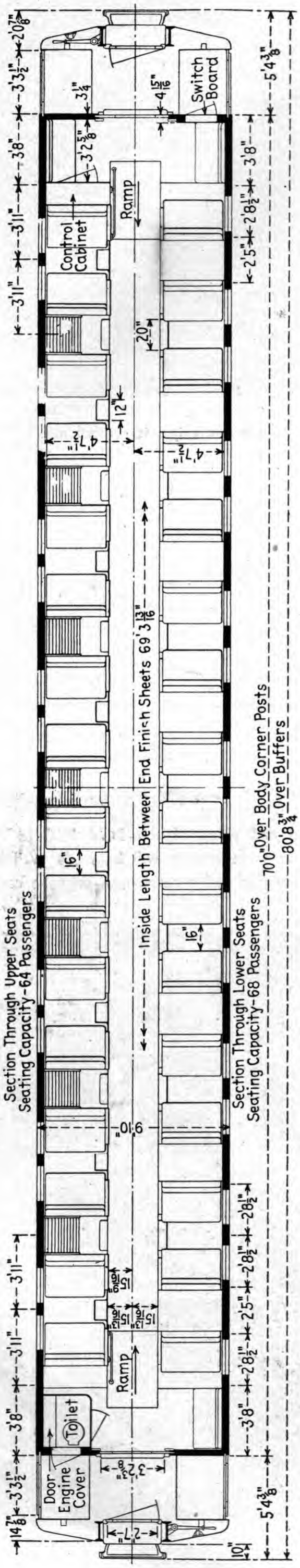
NOTE: Mail or Postal Cars are built to Plans and Specifications of United States Government Railway Mail Service from whom Specifications can be obtained.

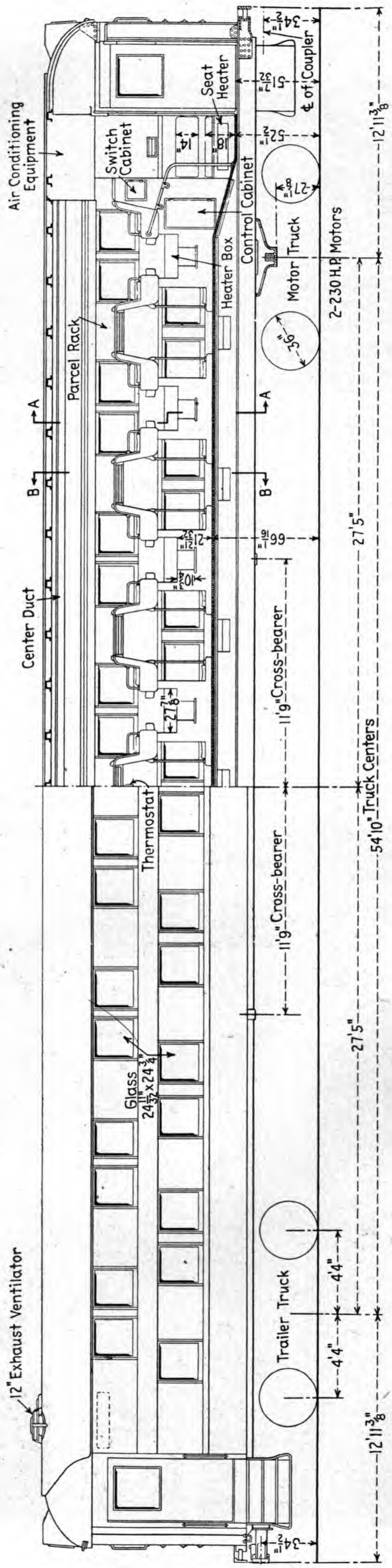
The Budd Diesel rail car is powered by two General Motors 275-hp. engines and has a torque-converter transmission.

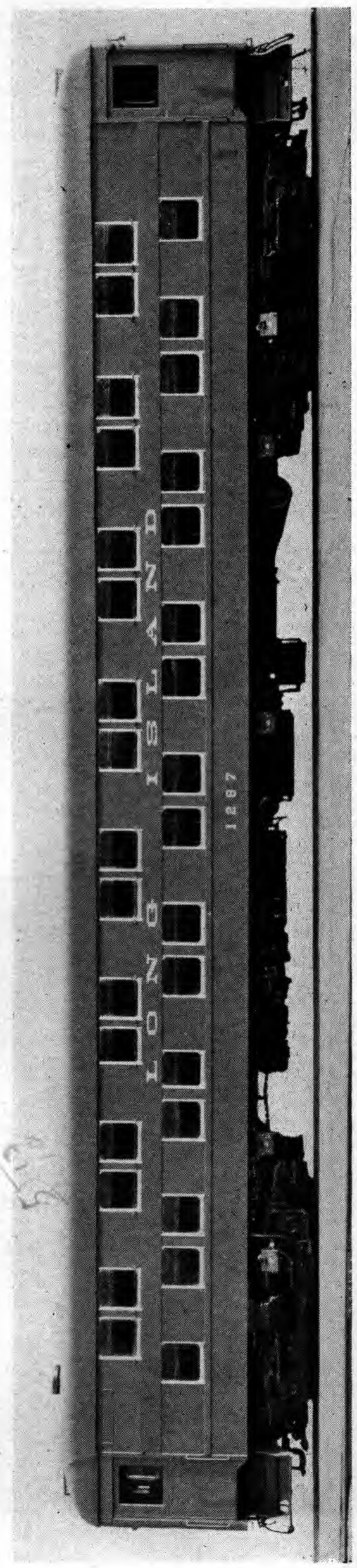


Interior and end views of the Budd RDC-1. Two other interior arrangements will be made available, a coach-baggage and a coach-mail-baggage car.

Builder, The Budd Company

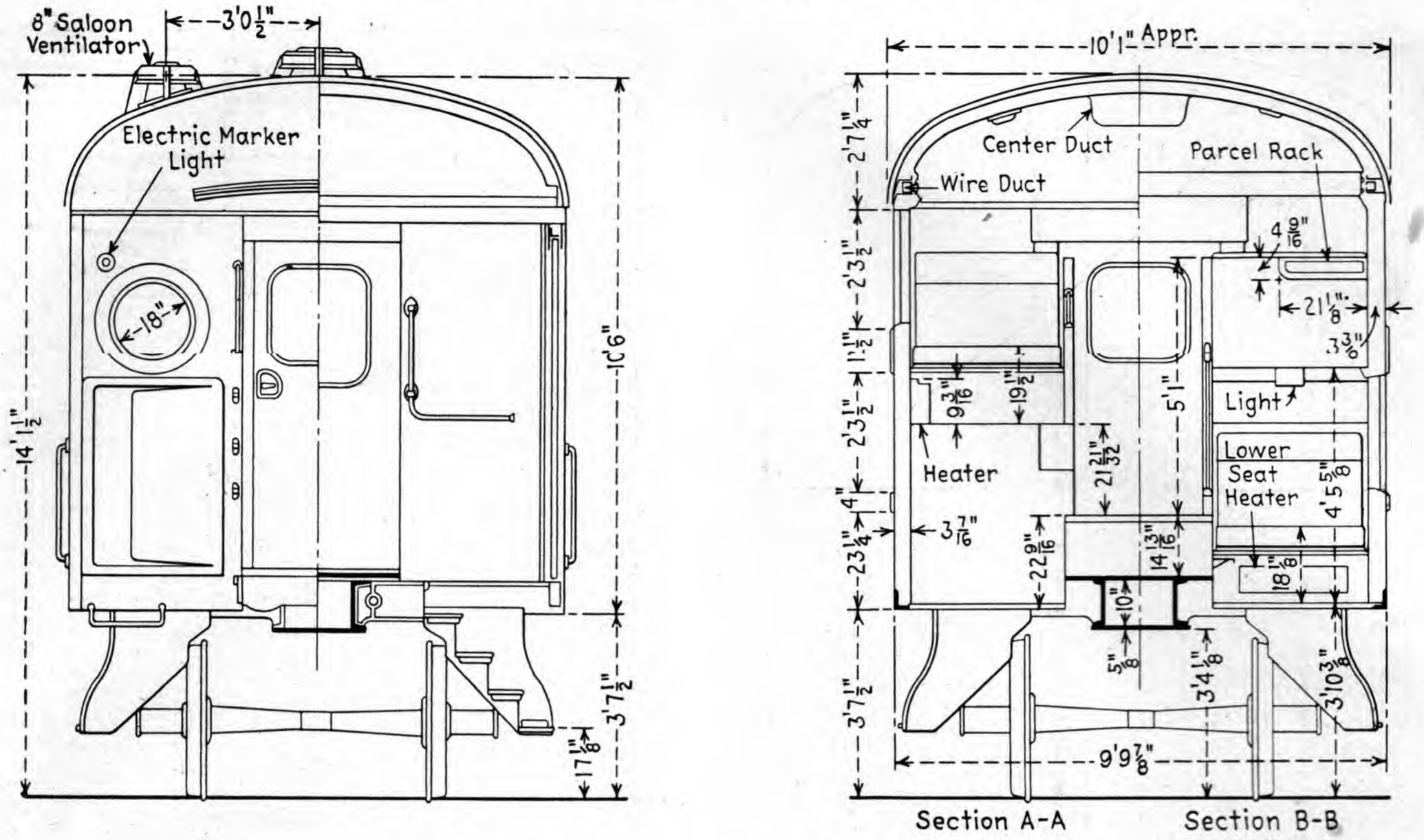






Long Island double-deck cars built at Altoona Works of the Pennsylvania.

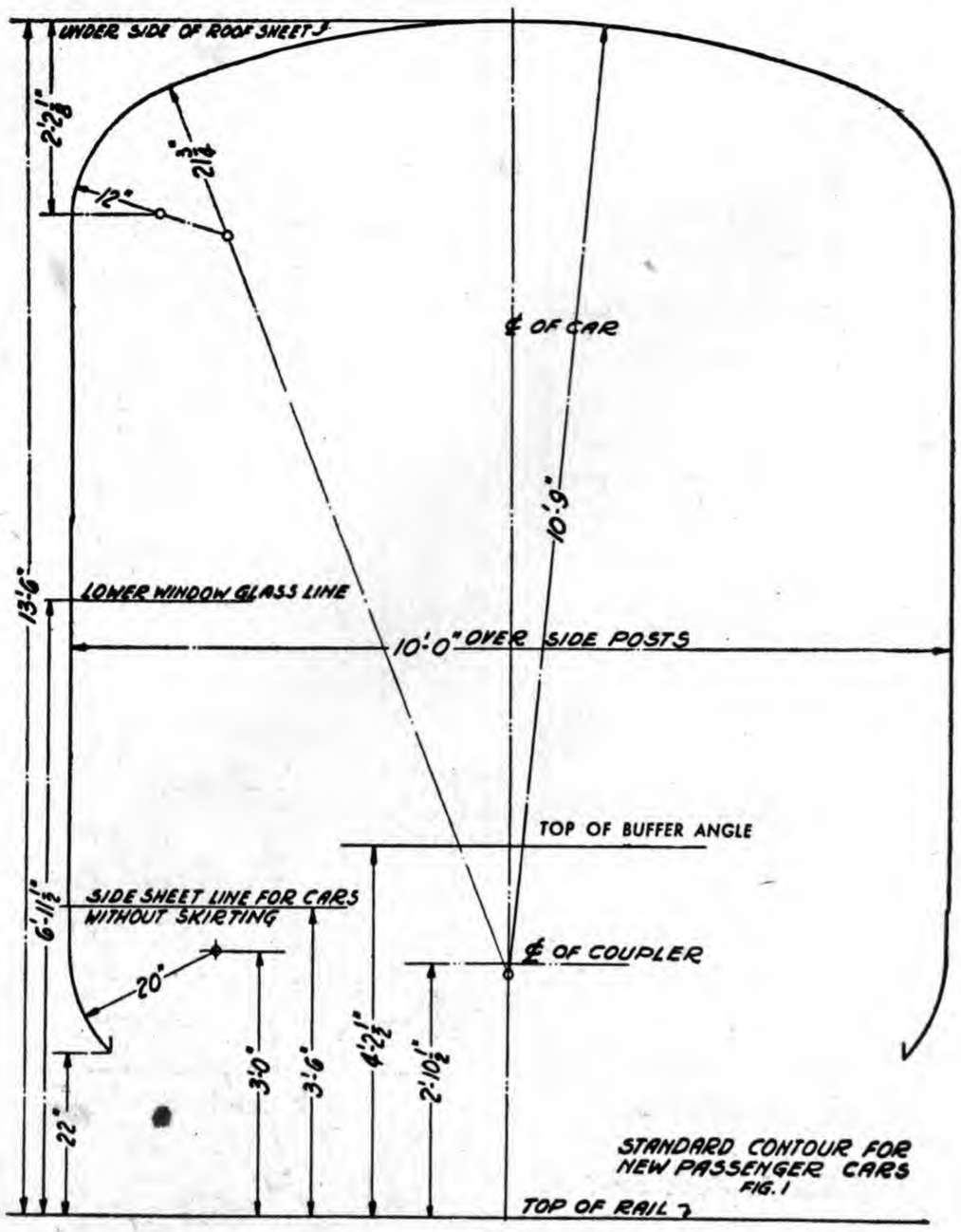
(*See opposite page*)



End view and cross-sections of Long Island double-deck cars.

Height, rail to top of roof ventilator, 14 ft. 7 29/32 in.; headroom in center aisle, 7 ft., 7½ in.; truck wheelbase, 8 ft. 8 in.; two motors, 198 hp. each at the rail; total weight at rail, 117,720 lb.

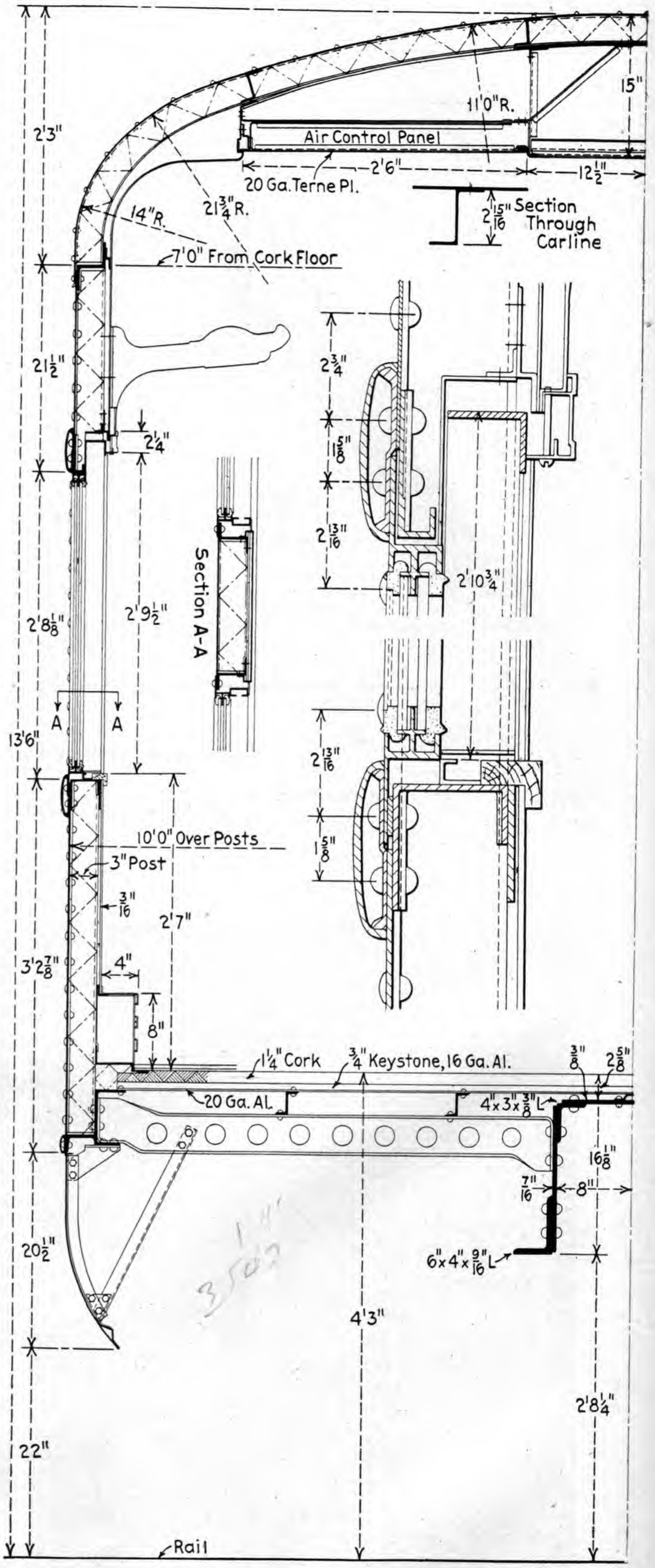
Left to right—Interior view from end of car and upper and lower seat arrangement.



A. A. R. standard contour for new passenger cars.

A. A. R. Manual, Adopted 1940, *revised* 1947

Missouri Pacific "Eagle" cars—side and roof framing—aluminum construction. American Car and Foundry Company.

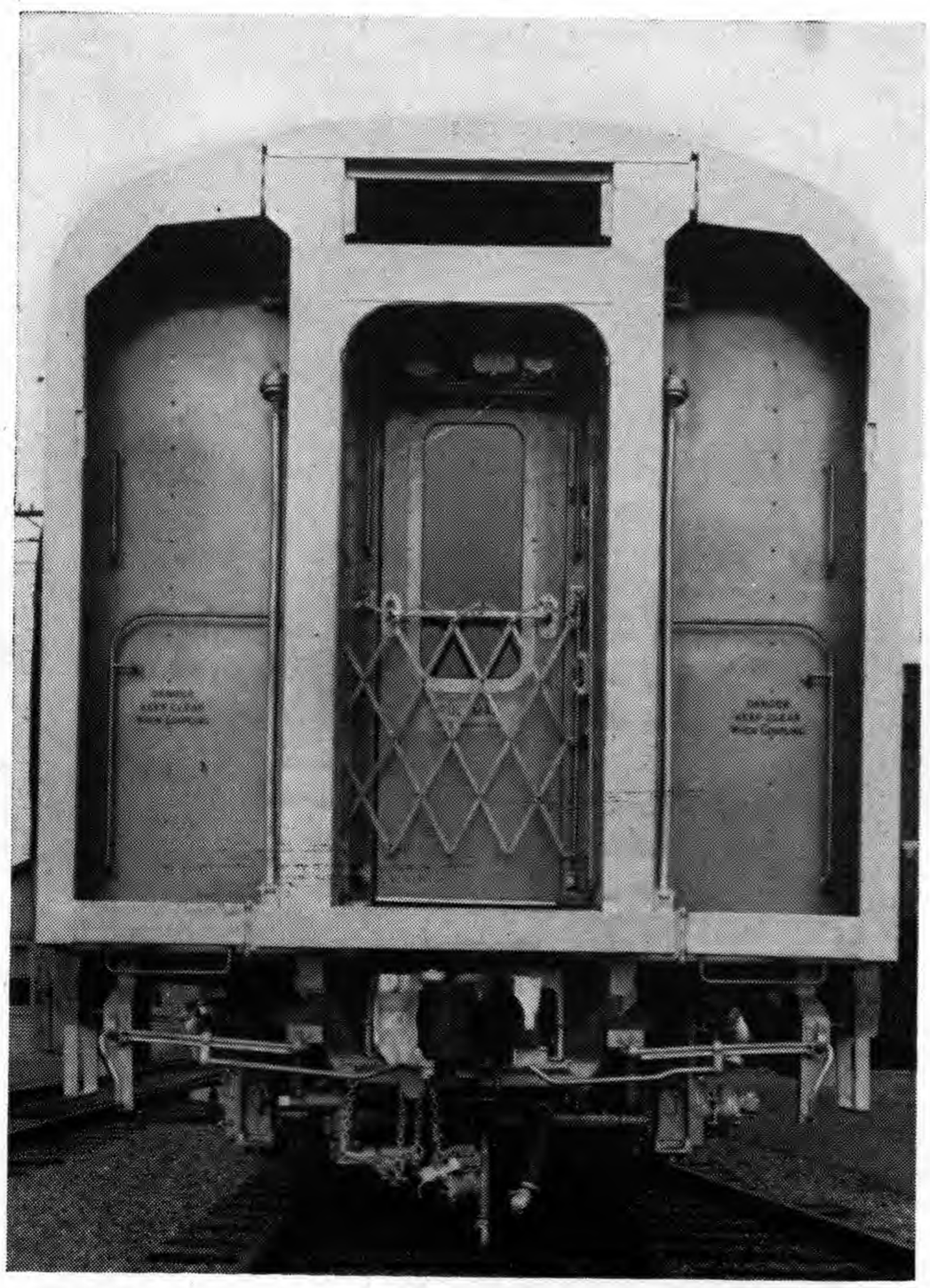


Cross-section of the aluminum-alloy cars of the Missouri-Pacific "Eagle" cars. Builder, American Car and Foundry Company.

Descriptions: *Railway Age,* February 24, 1940; *Railway Mechanical Engineer,* March 1940

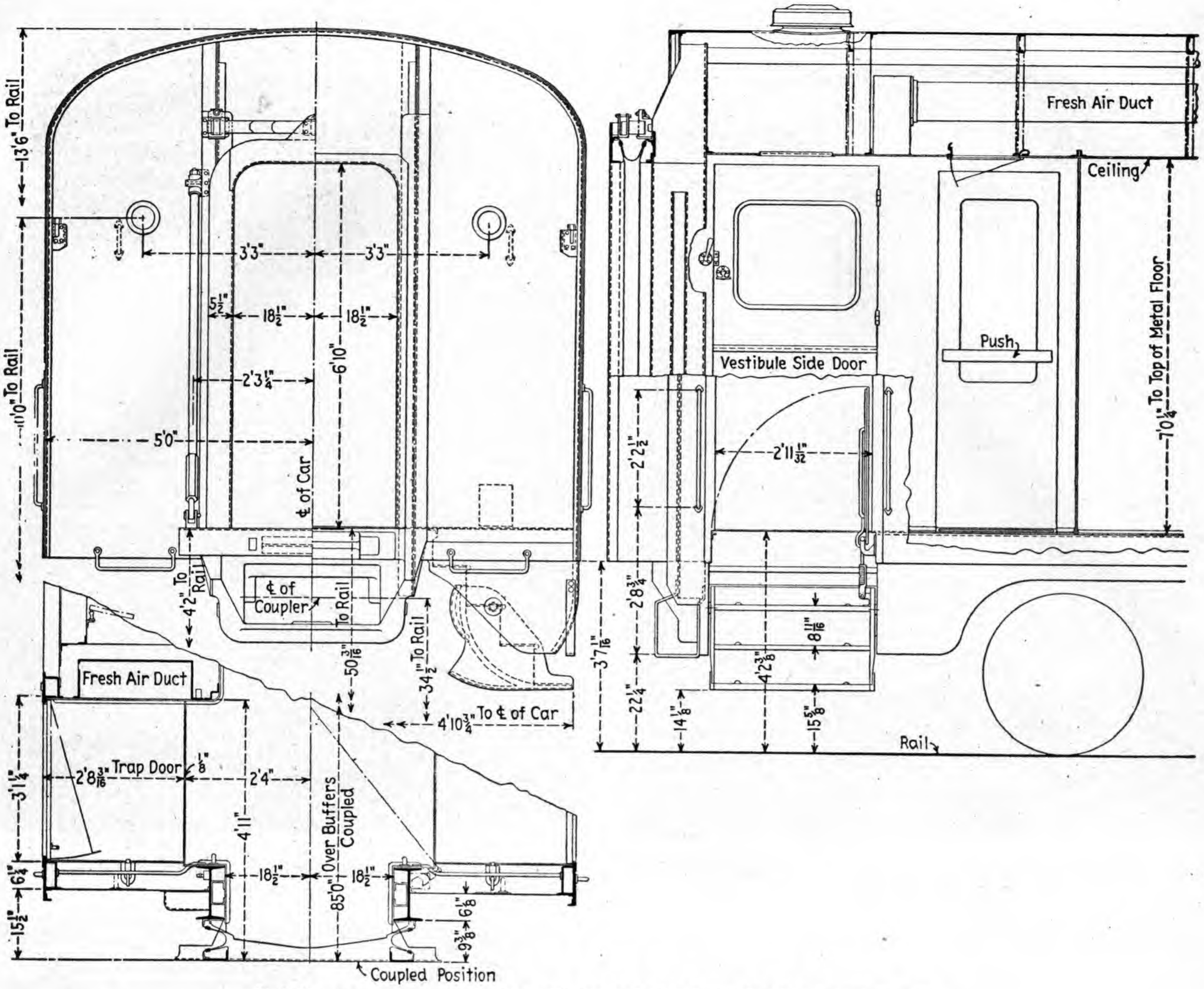
Blind end with inner diaphragm only. End gate applied. Pennsylvania R. R. sleeping car.

Blind end with inner diaphragm only. Pennsylvania R.R. roomette-bedroom car.

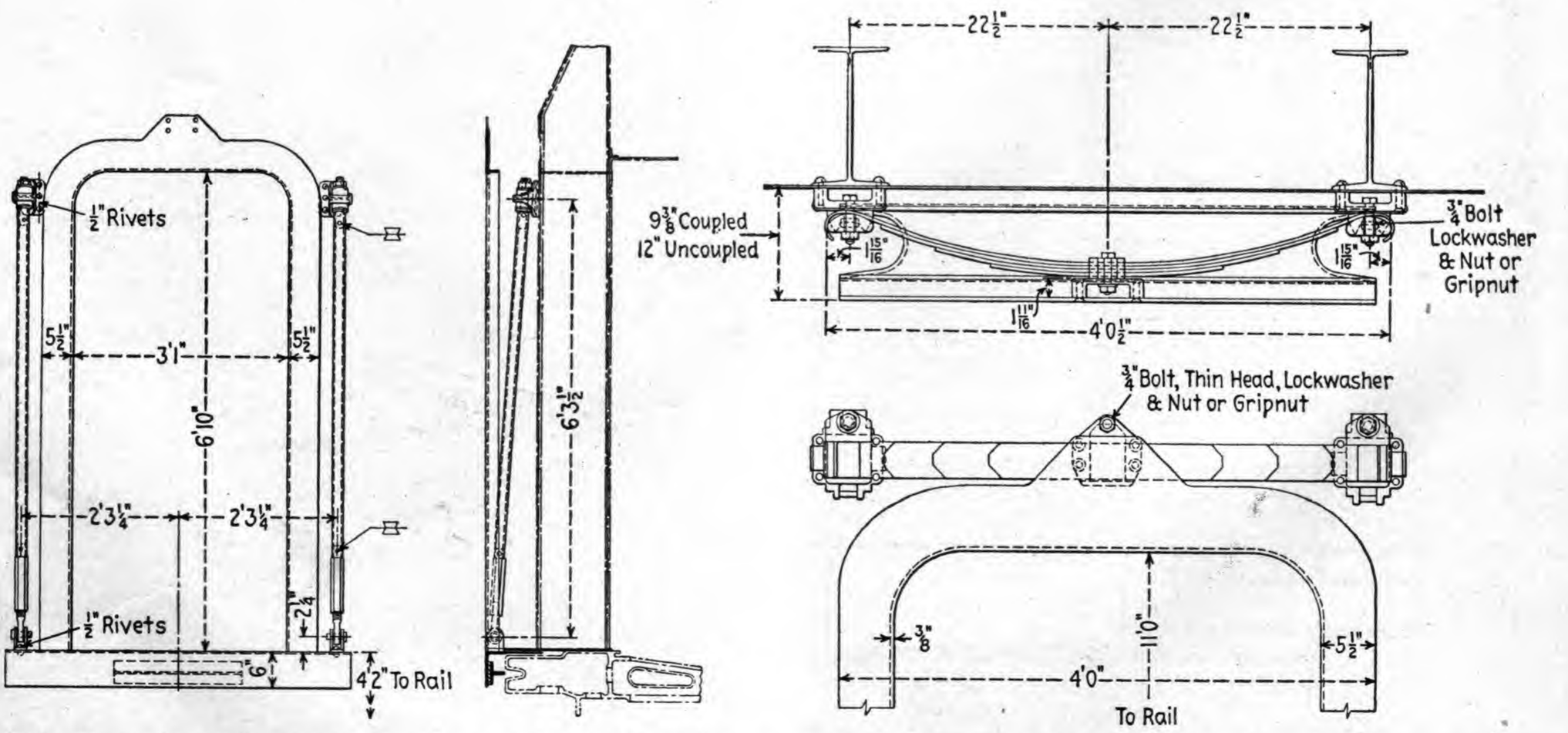


Blind end with inner and outer diaphragms. Seaboard Air Line lounge car.

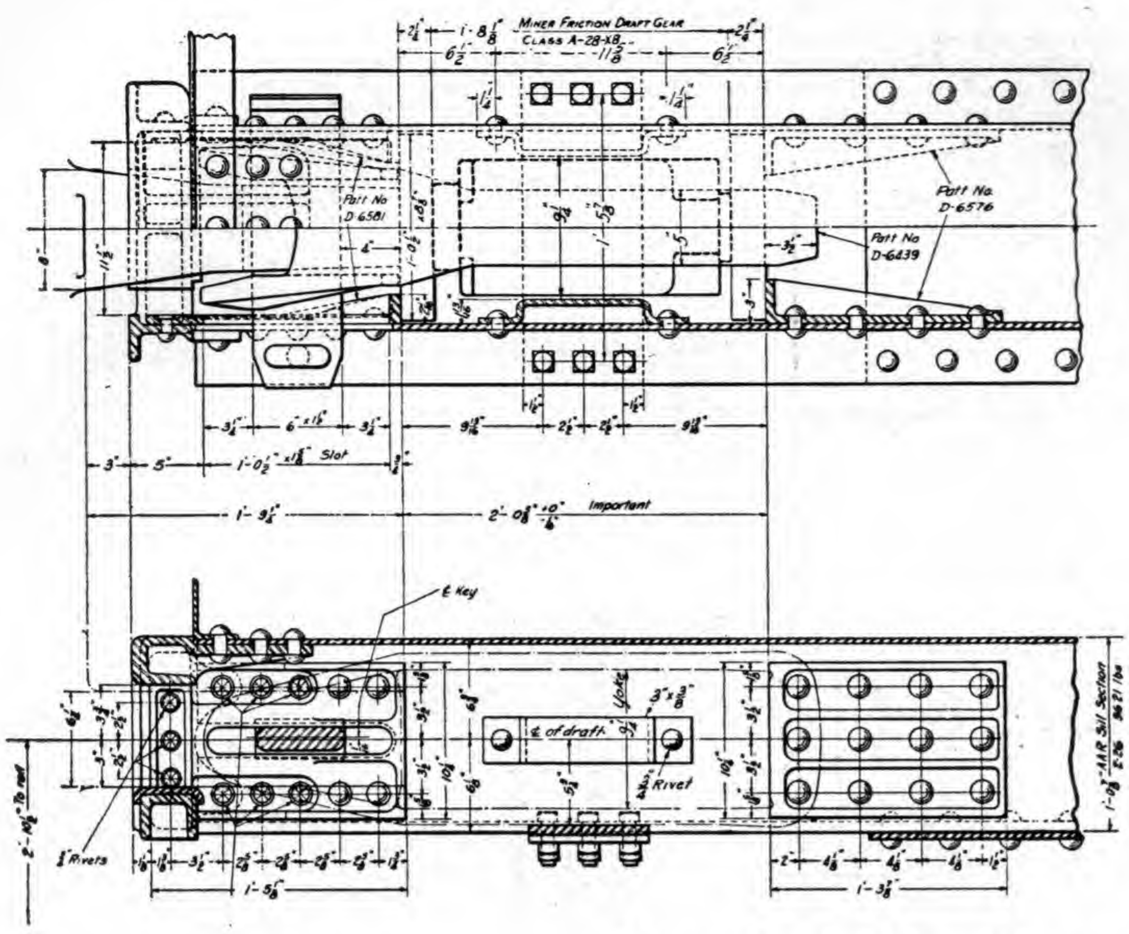
Blind end with inner diaphragm only. Union Pacific club-lounge car.



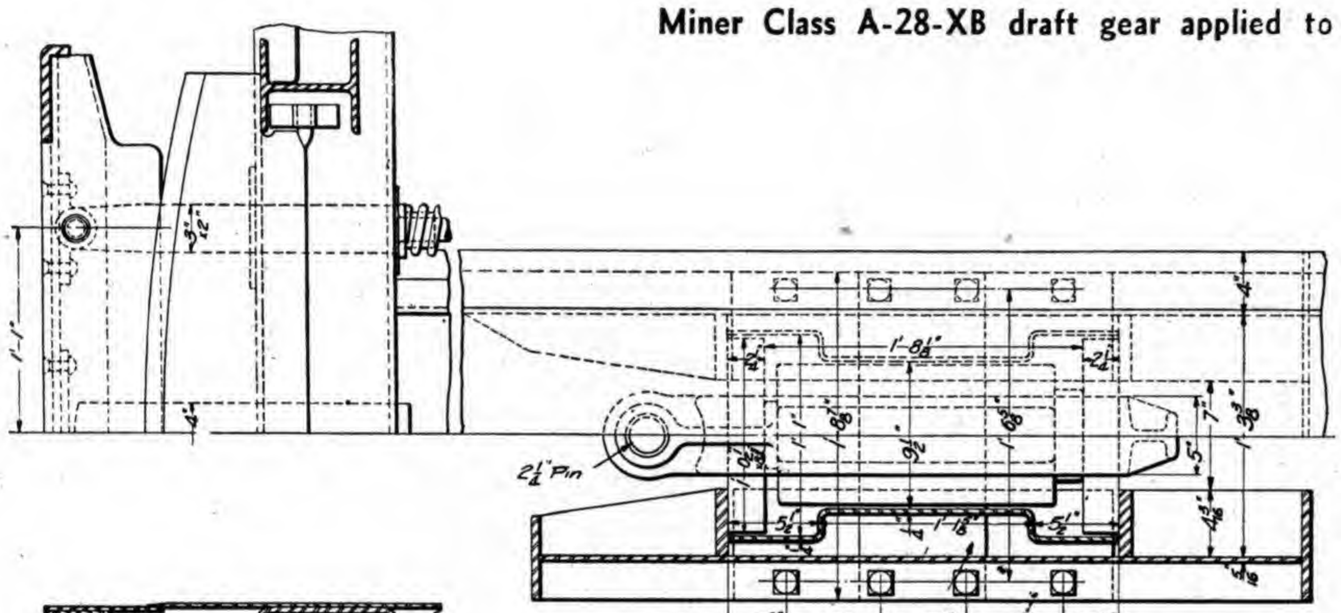
End framing arrangement of vestibule end for Pennsylvania passenger cars.

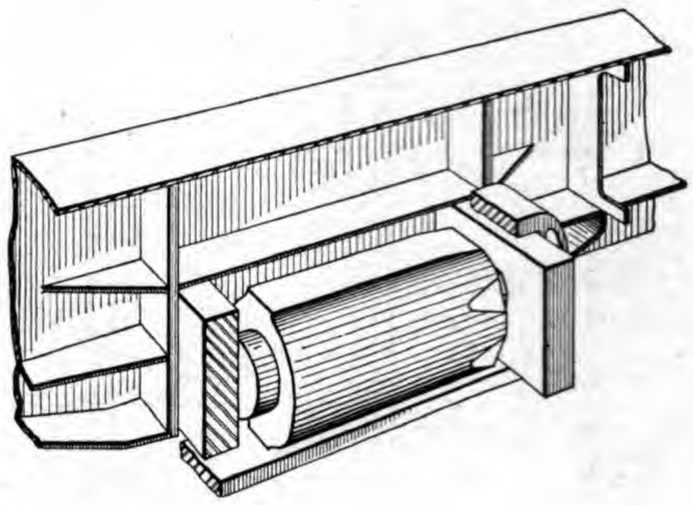


Left—Suspension rod arrangement of suspended buffer and upper buffer spring application (right) for Pennsylvania passenger cars.

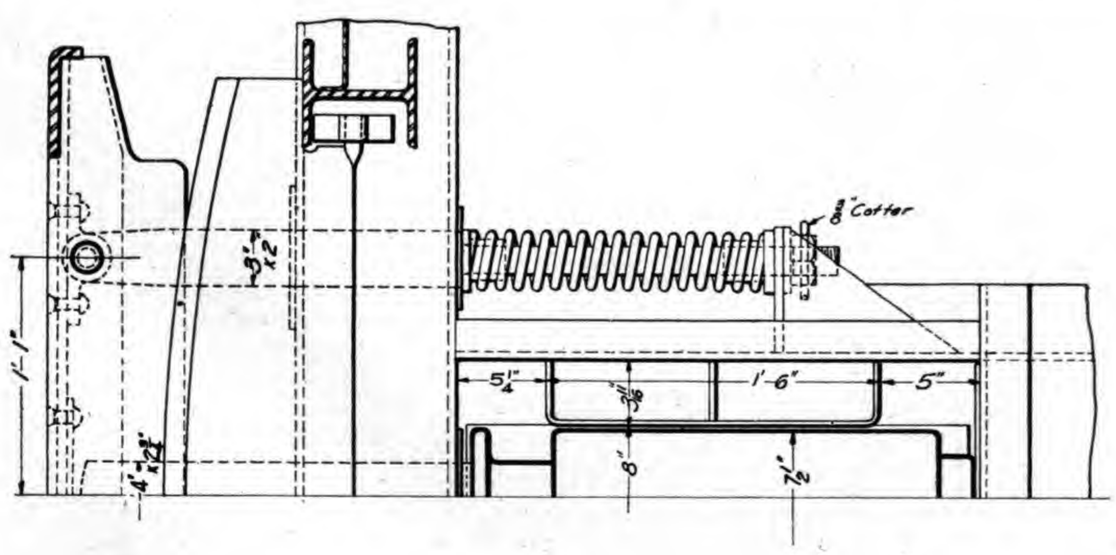


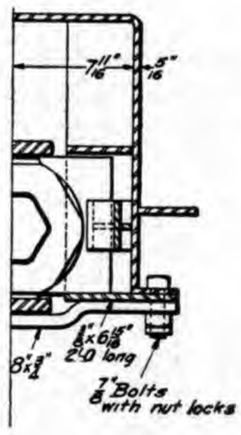
Miner Class A-28-XB draft gear applied to caboose car.



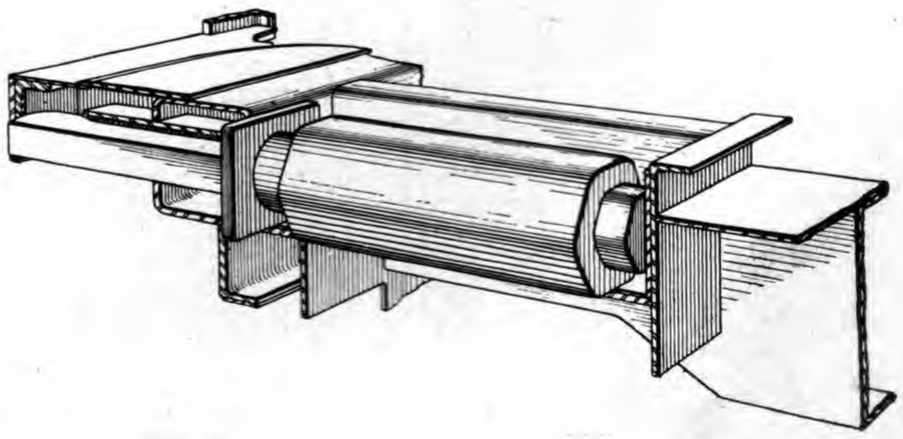


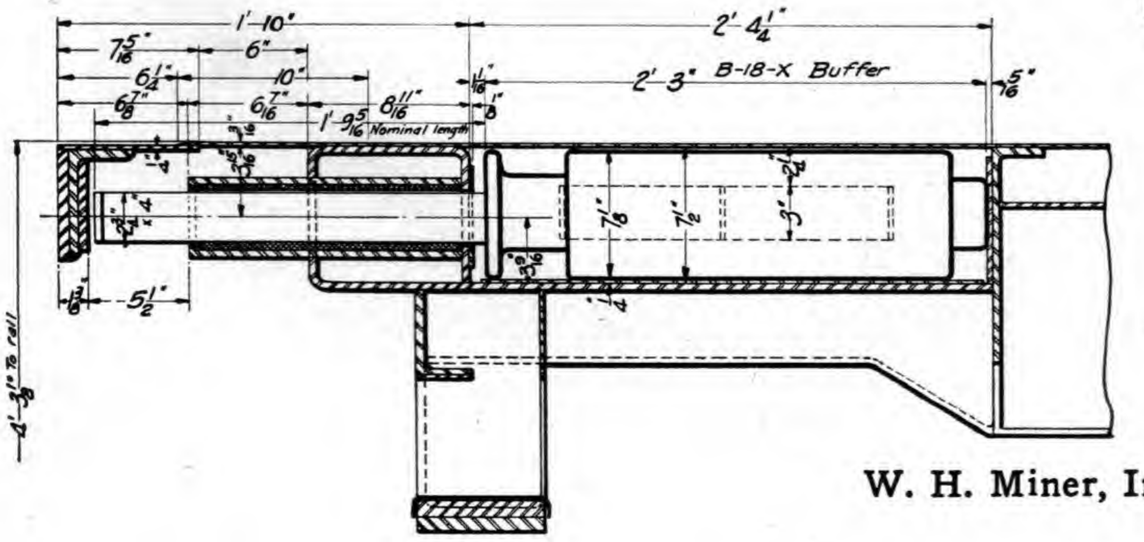
Miner Class A-4-XB friction draft gear applied to passenger equipment.



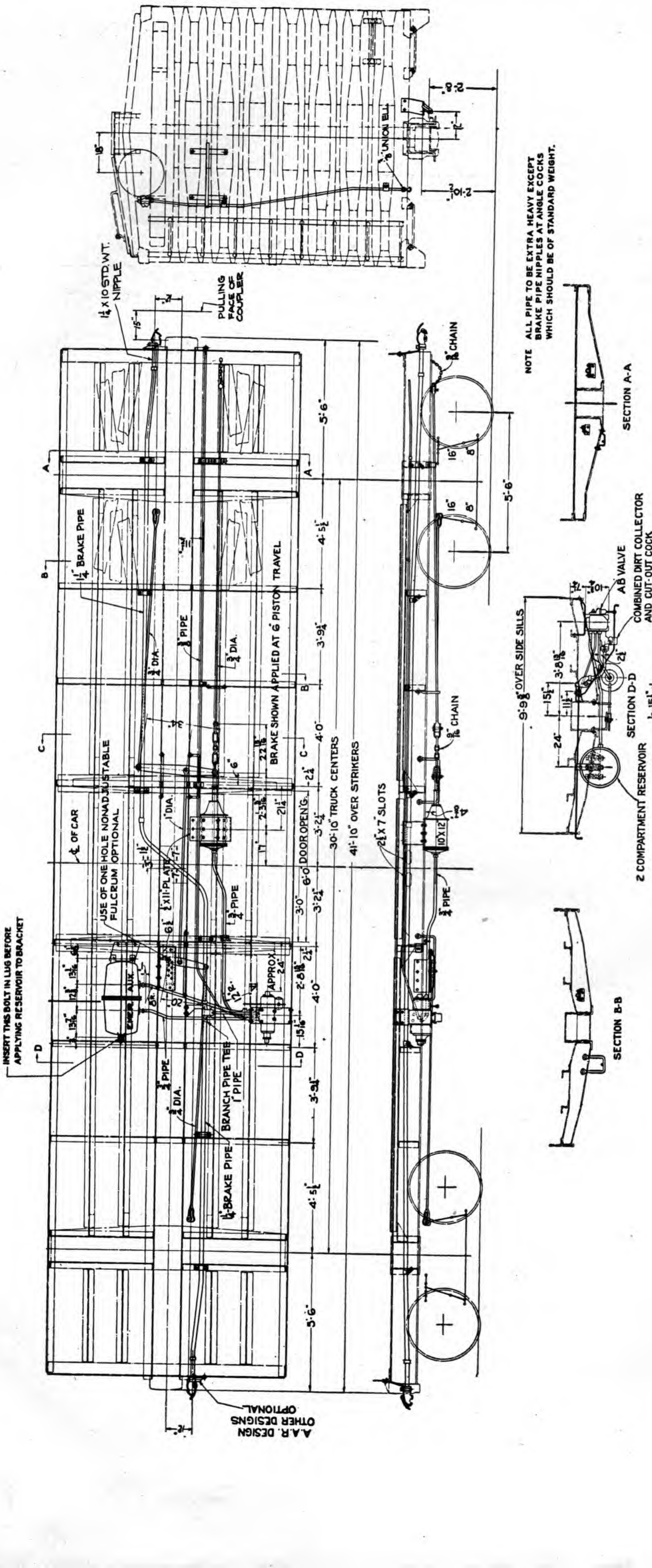


Miner Class B-18-X friction buffer applied to passenger equipment.

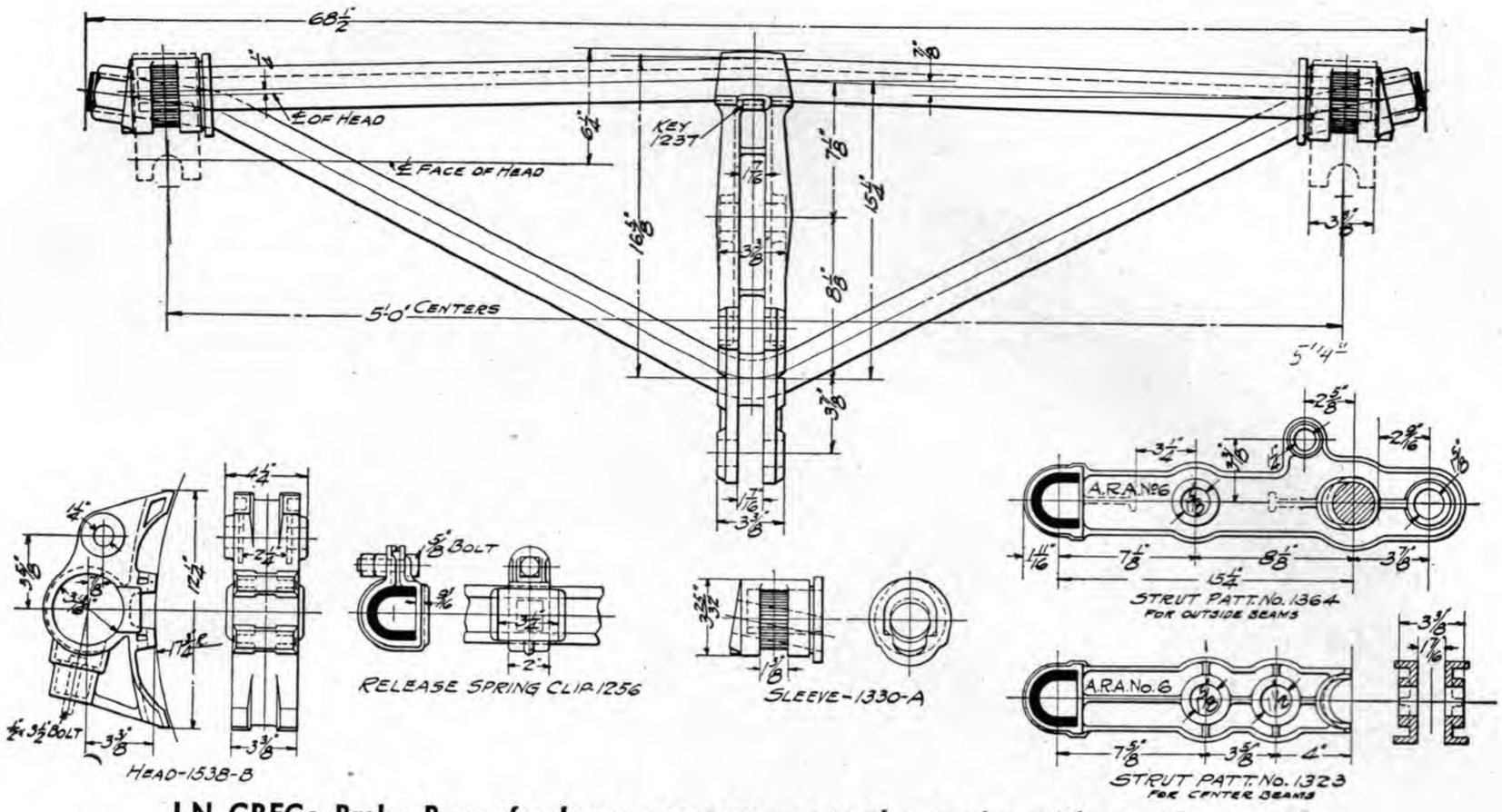




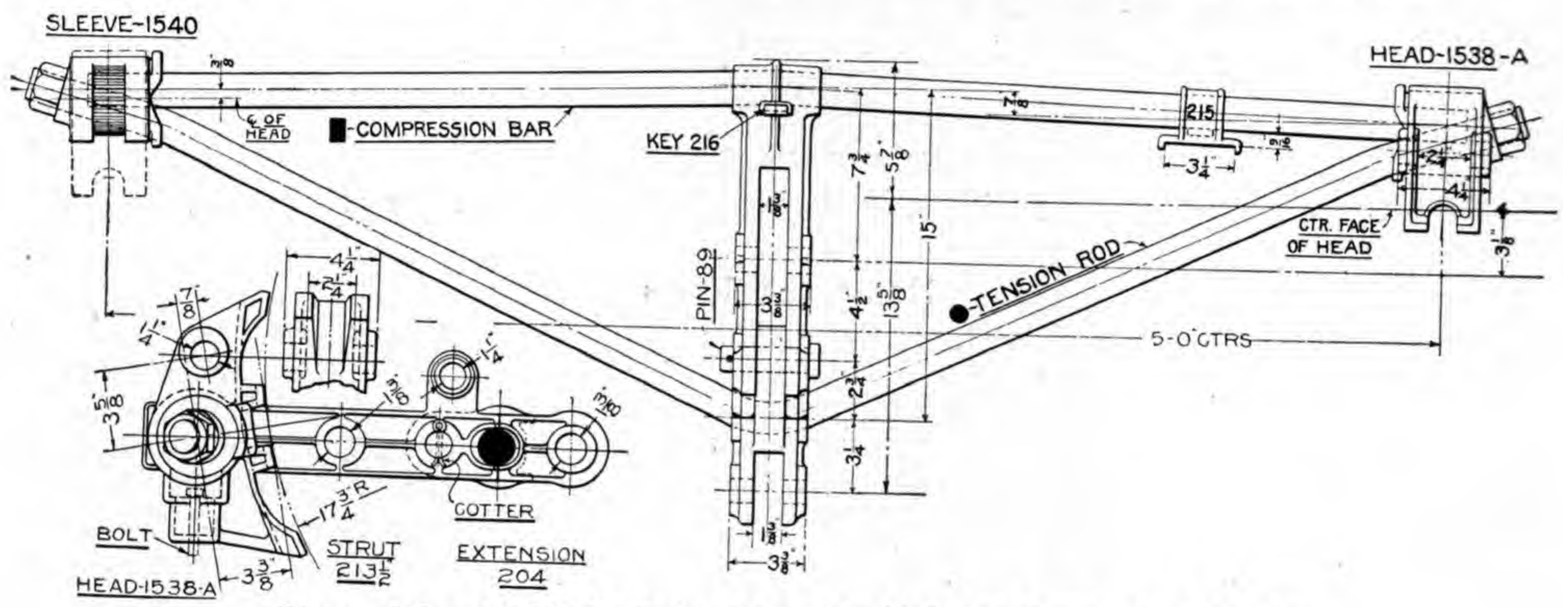
W. H. Miner, Inc.



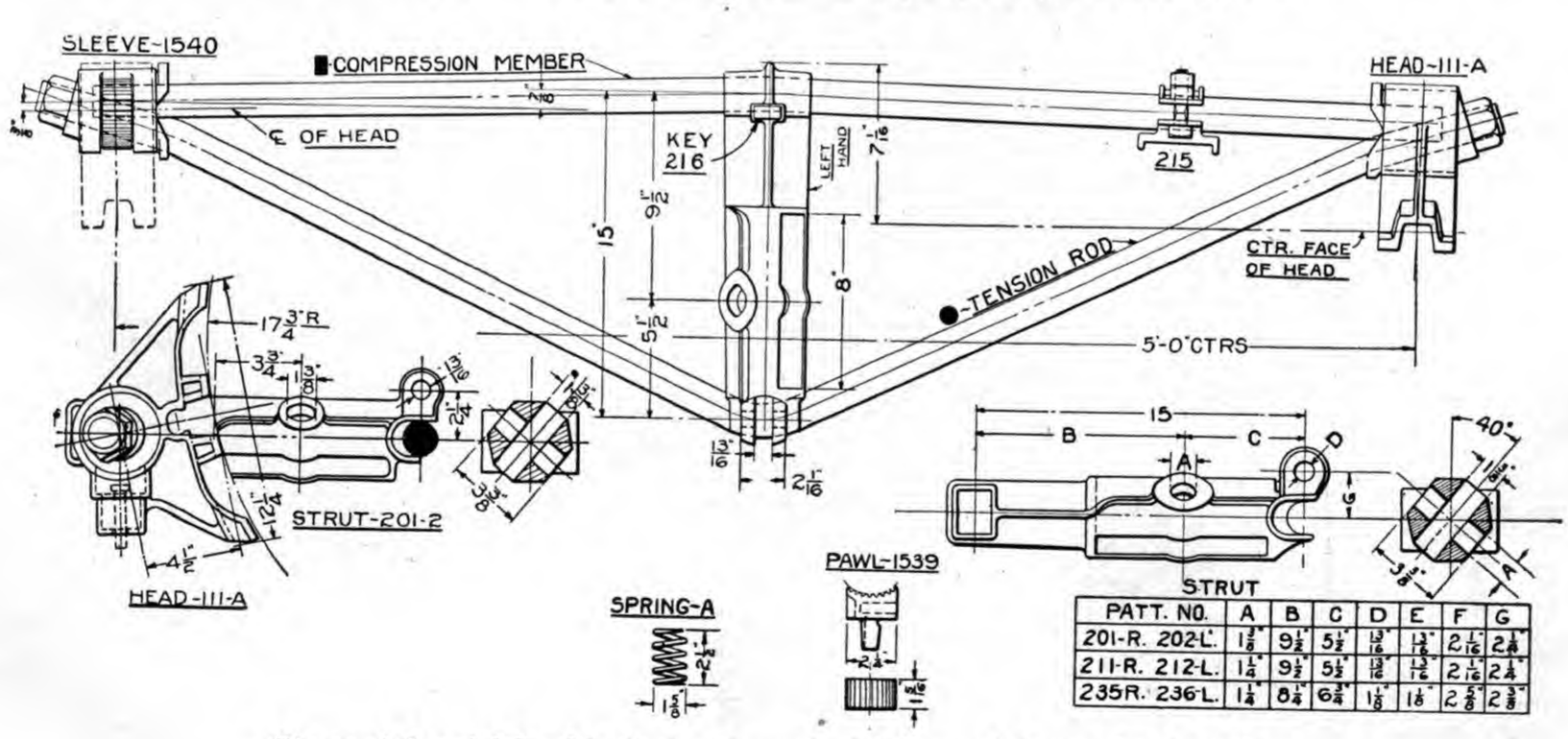
General arrangement of AB type brake on A.A.R. standard steel sheathed 40 ft. 6 in. box car.
(*Manual, Plate No.* 1516-*E*)



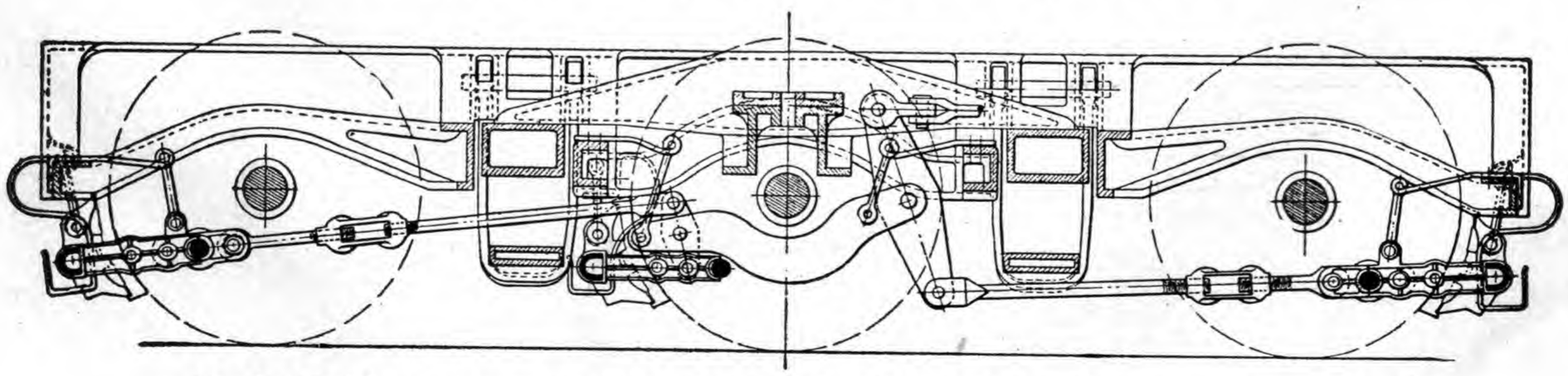
LN CRECo Brake Beam for heavy passenger or tender service with six-wheel trucks.



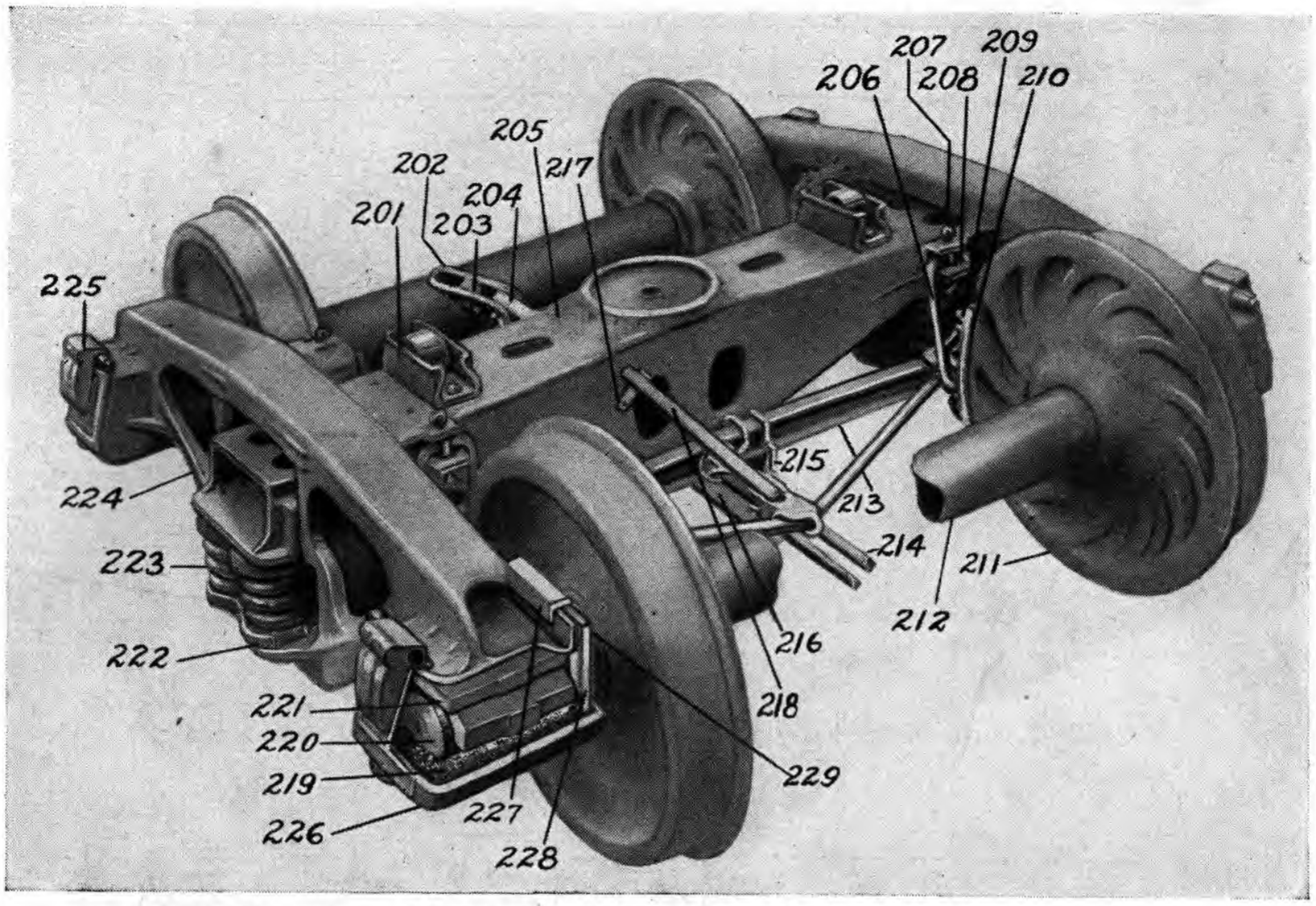
Diamond Special Triple Brake Beam for high-speed six-wheel trucks.


SLEEVE-1540
COMPRESSION MEMBER
℄ OF HEAD
KEY 216
LEFT HAND
215
HEAD-111-A
CTR. FACE OF HEAD
TENSION ROD
5'-0" CTRS
STRUT-201-2
HEAD-111-A
PAWL-1539
SPRING-A
STRUT
PATT. NO. | A | B | C | D | E | F | G
201-R. 202-L. | 1 1/8" | 9½" | 5½" | 13/16" | 1 1/16" | 2 1/16" | 2 1/8"
211-R. 212-L. | 1¼" | 9½" | 5½" | 13/16" | 1 1/16" | 2 1/16" | 2¼"
235R. 236-L. | 1¼" | 8¼" | 6¾" | 1⅛" | 1⅛" | 2 5/8" | 2 3/8"

Diamond Special Double Brake Beam for high-speed four-wheel trucks.



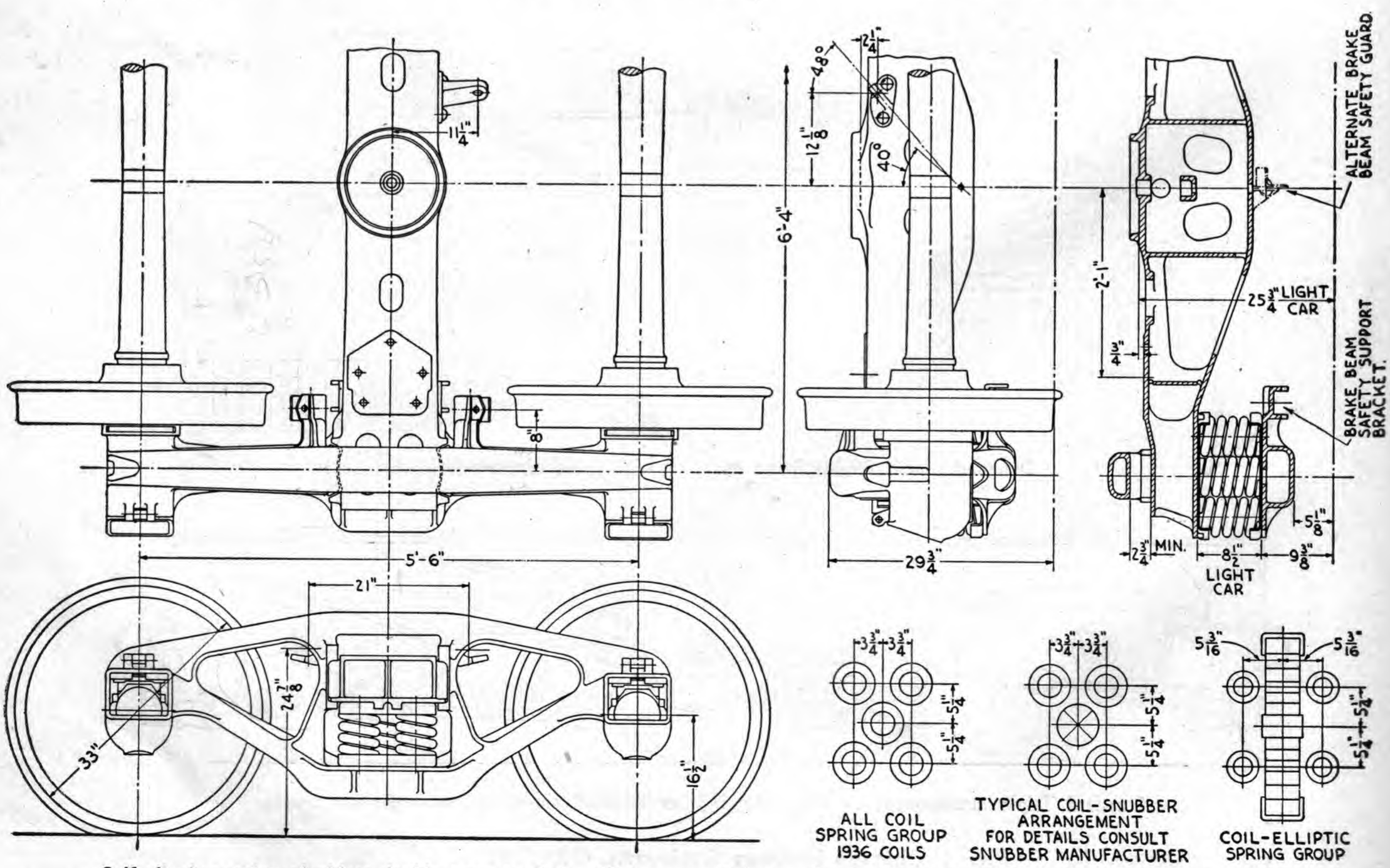
Standard Triple arrangement of Brake Rigging for all-steel six-wheel passenger car trucks.



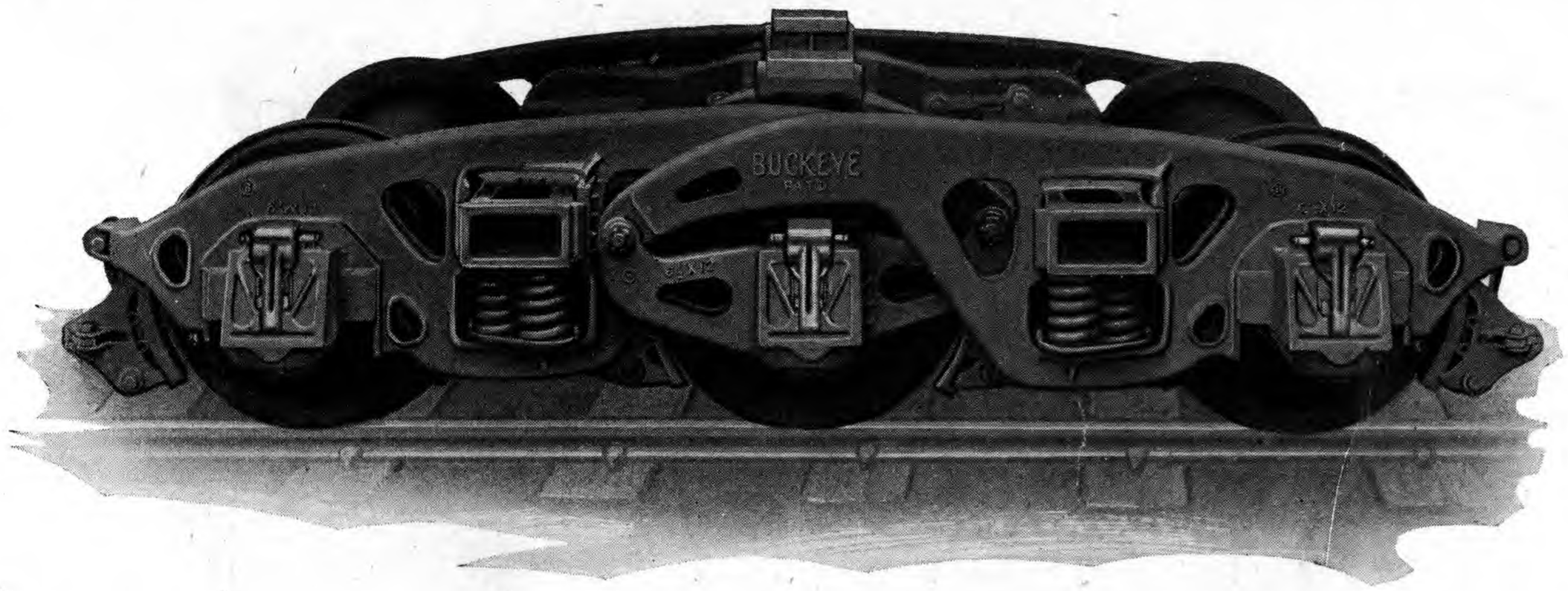
A.A.R. self-aligning spring plankless double-truss truck. American Car and Foundry Co.

Names of Parts

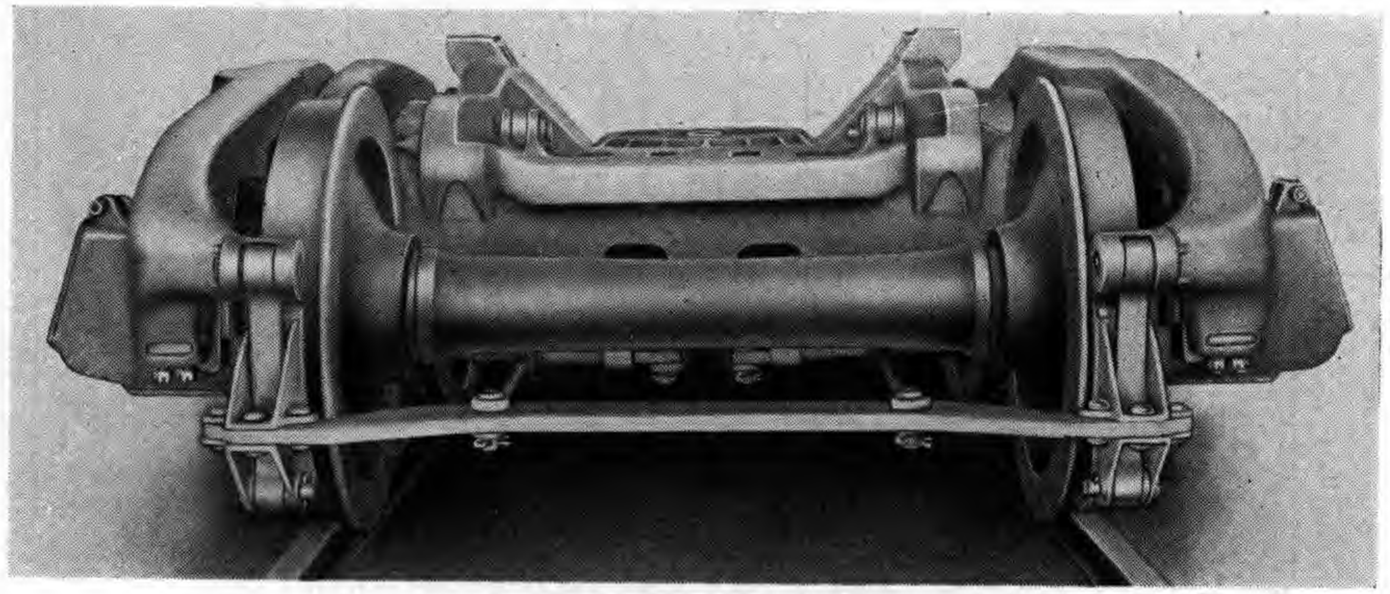
201 *Truck Side Bearing*
202 *Dead Lever Guide*
203 *Dead Lever*
204 *Dead Lever Guide Bracket*
205 *Truck Bolster*
206 *Brake Hanger*
207 *Brake Hanger Key*
208 *Brake Hanger Wear Plate*
209 *Brake Shoe Key*
210 *Brake Shoe*
211 *Wheel*
212 *Axle*
213 *Brake Beam*
214 *Bottom Connection*
215 *Bottom Connection Support*
216 *Brake Beam Safety Support*
217 *Brake Pin*
218 *Live Lever*
219 *Journal Box Waste*
220 *Journal Bearing*
221 *Journal Bearing Wedge*
222 *Truck Spring Plate*
223 *Truck Springs*
224 *Truck Side Frame*
225 *Journal Box Lid*
226 *Journal Box*
227 *Dust Guard Retainer*
228 *Dust Guard*
229 *Dust Guard Wedge*



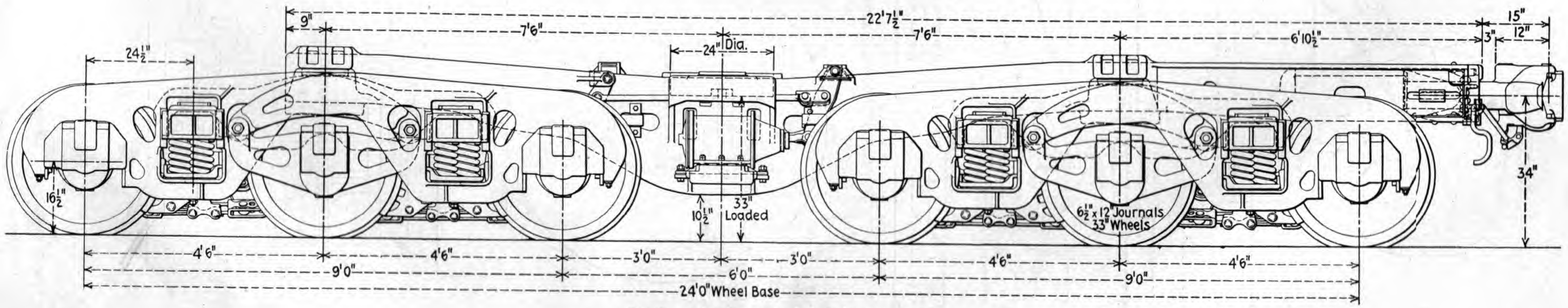
Self-aligning spring-plankless double-truss truck for 40-ton capacity cars. A.A.R. conditions with 25¾ in. center plate height.



(Left)—Side view of Buckeye six-wheel freight car truck.

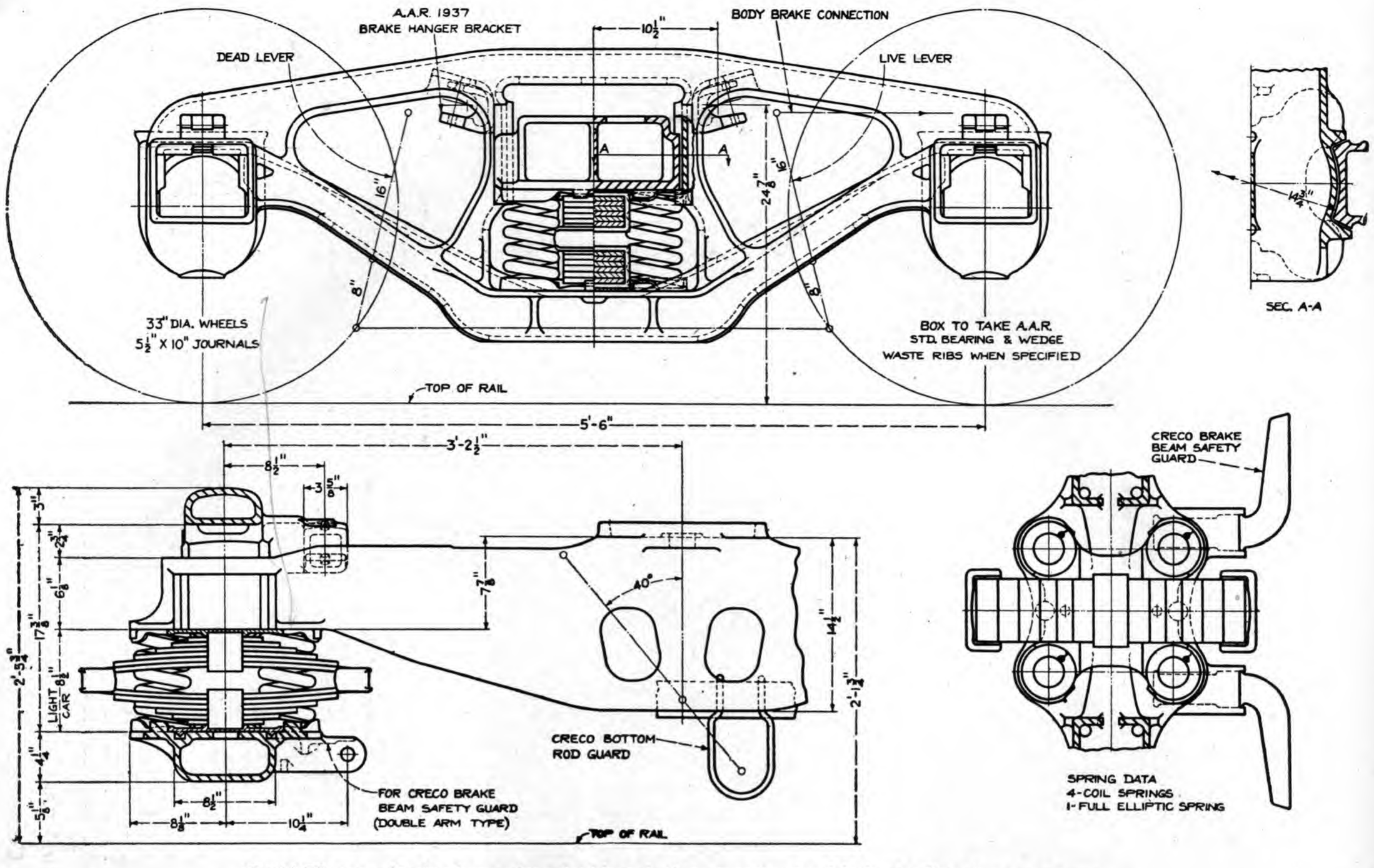


End view of a Buckeye six-wheel freight car truck.

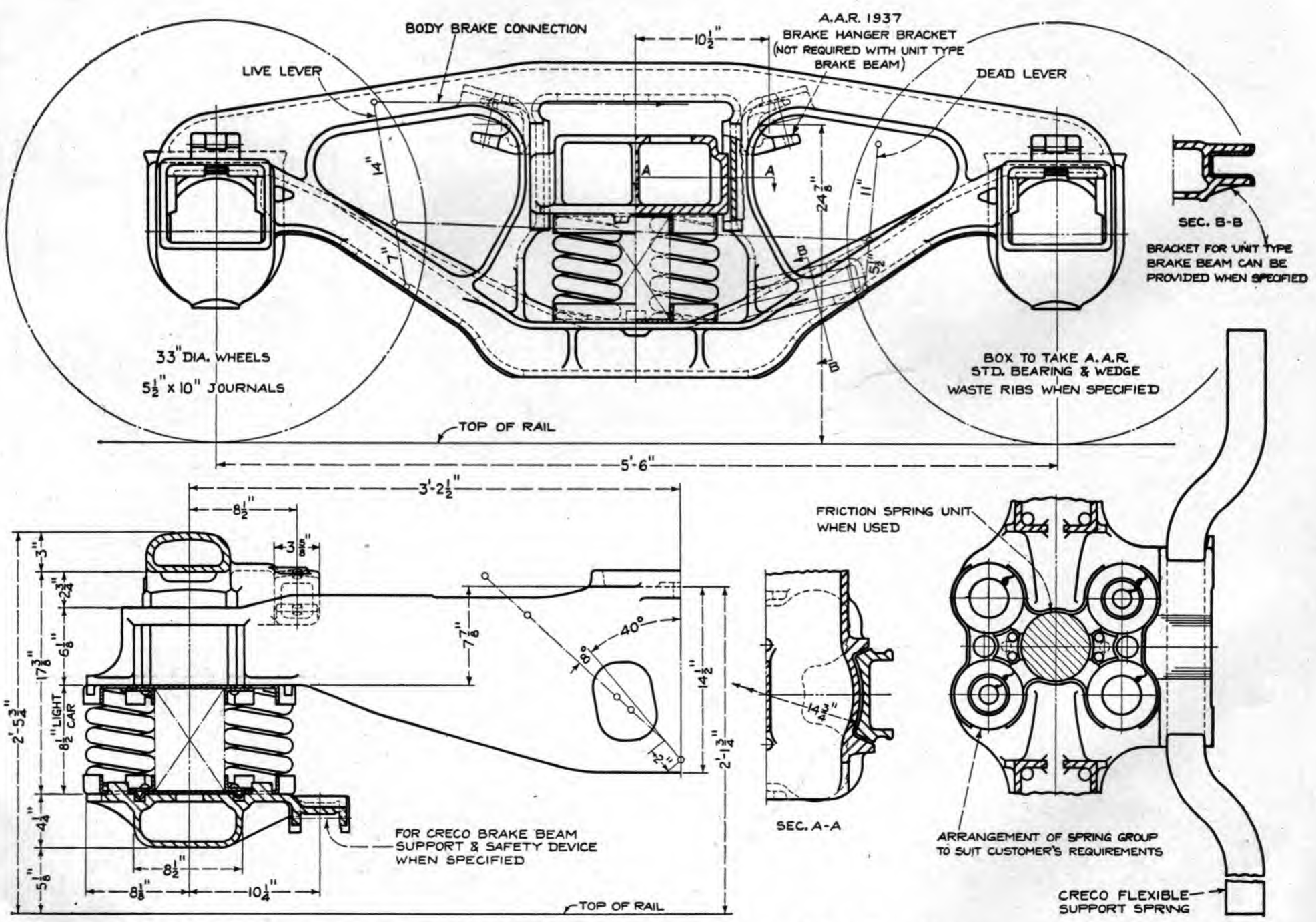


Buckeye twelve-wheel freight car truck.

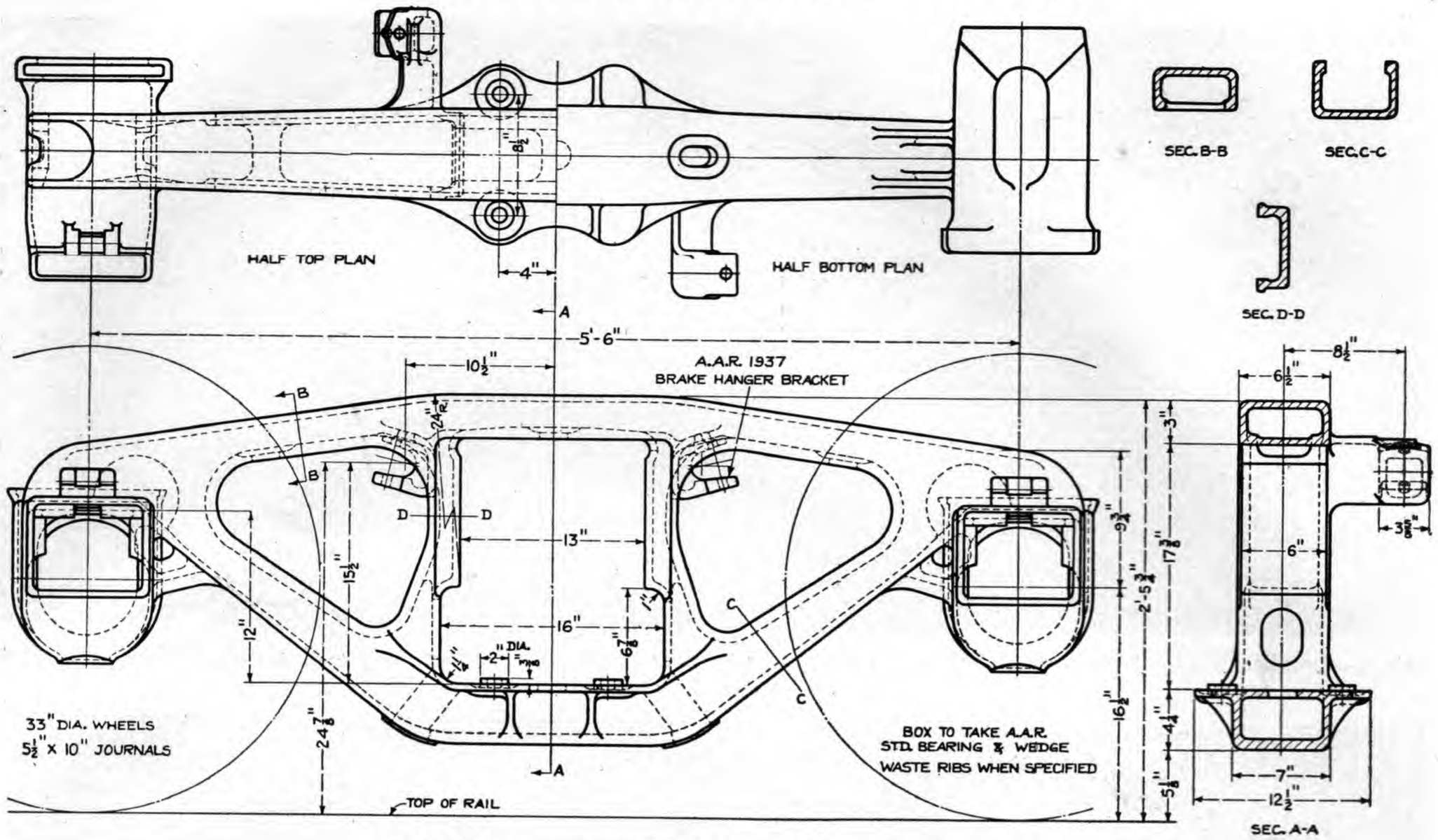
The Buckeye Steel Castings Company.



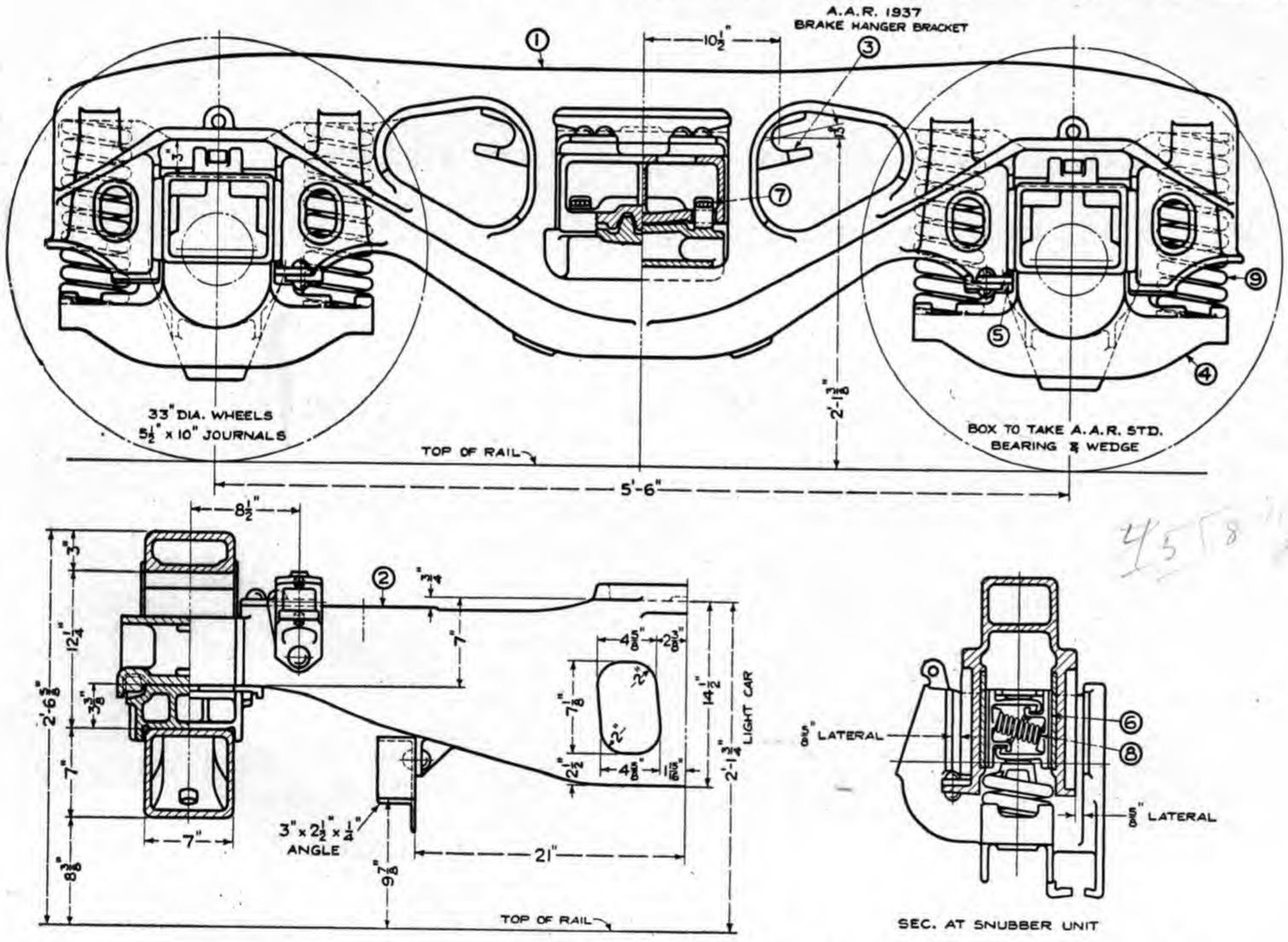
Gould 50-ton self-aligning spring-plankless double-truss truck with "coil-elliptic" spring group.



Gould 50-ton self-aligning spring-plankless double-truss truck with coil-snubber spring group.



Gould 50-ton conventional design integral box type truck frame.



SPRING DATA PER SIDE FRAME
(FRAME SOLID ON JOURNAL BOX)

50,000 LBS. PAY LOAD

4-COIL SPRINGS (5½" O.D. x 1⅜"), CAPACITY 33,700 LBS.

145,000 LBS. RAIL LOAD

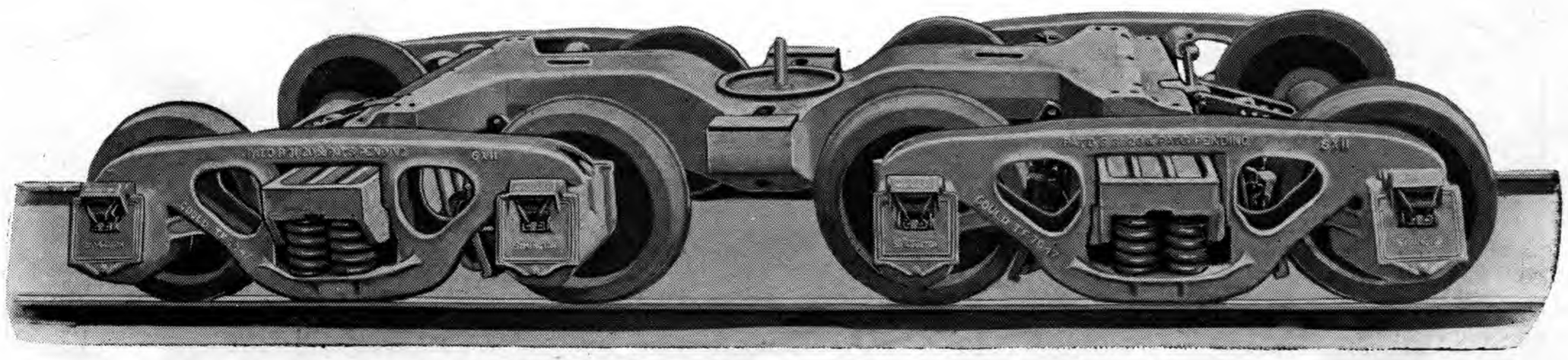
4-OUTER COIL SPRINGS (5½" O.D. x 1⅜") = 33,700
4-INNER " " (3¼" O.D. x ⅞") = 17,600
TOTAL CAPACITY = 51,300 LBS.

169,000 LBS. RAIL LOAD

4-OUTER COIL SPRINGS (5½" O.D. x 1⅜") = 33,700
4-INNER " " (3¼" O.D. x ¾") = 25,600
TOTAL CAPACITY = 59,300 LBS.

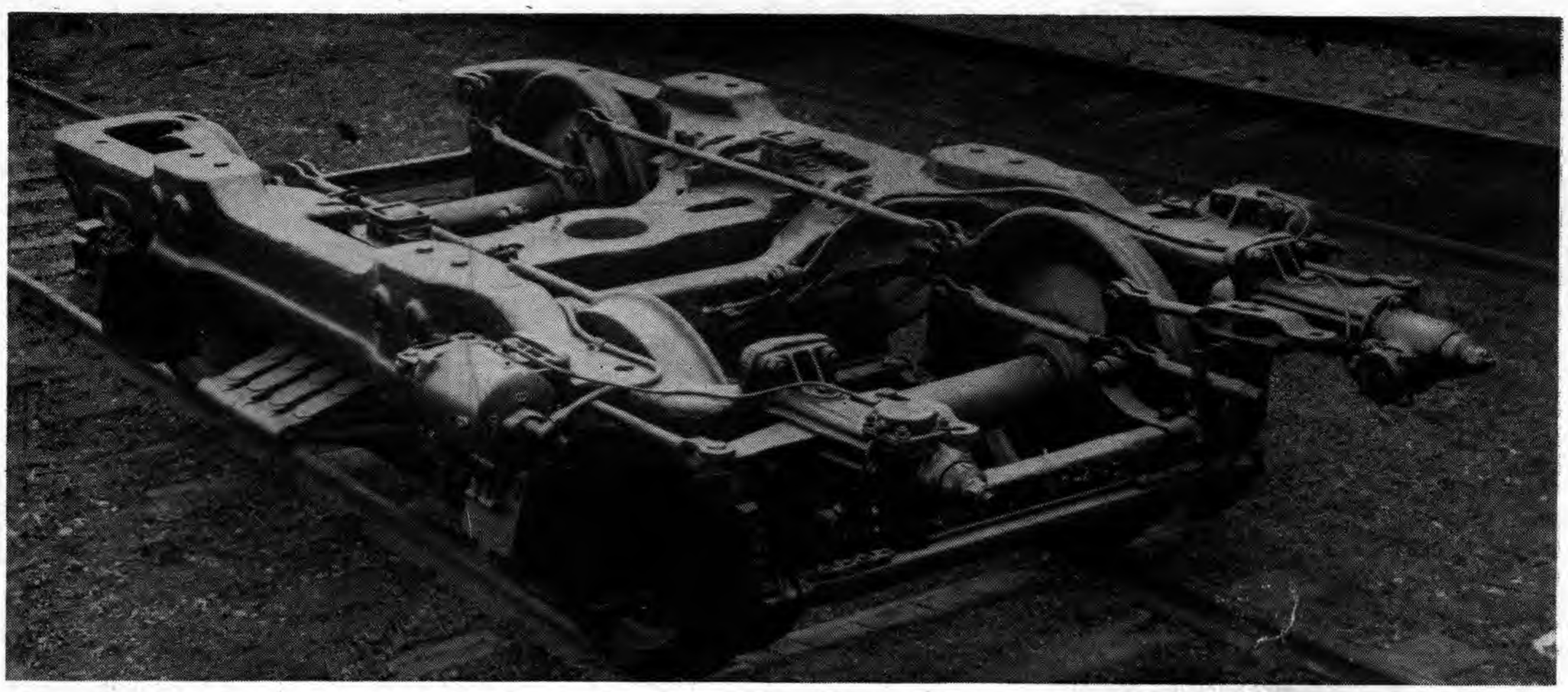
No. PER CAR	DESCRIPTION	ITEM No.
4	SIDE FRAME WITH LINERS APPLIED	1
2	BOLSTER WITH INTEGRAL ALIGNING TEETH & DEAD LEVER FULCRUM BRACKETS	2
4-R 4-L	BRAKE HANGER BRACKET RIVETED TO BOLSTER	3
8	JOURNAL BOX WITH LINERS APPLIED	4
16	JOURNAL BOX RETAINING PLATE ⅝" x 2¼" RIVETS	5
32	SNUBBER SHOE	6
4	EQUALIZING CHAIR ¾ 1½" x 2" COTTERS	7
16	SNUBBER SPRING	8
16	COIL SPRING	9

Symington Type "XL" high-speed freight truck.

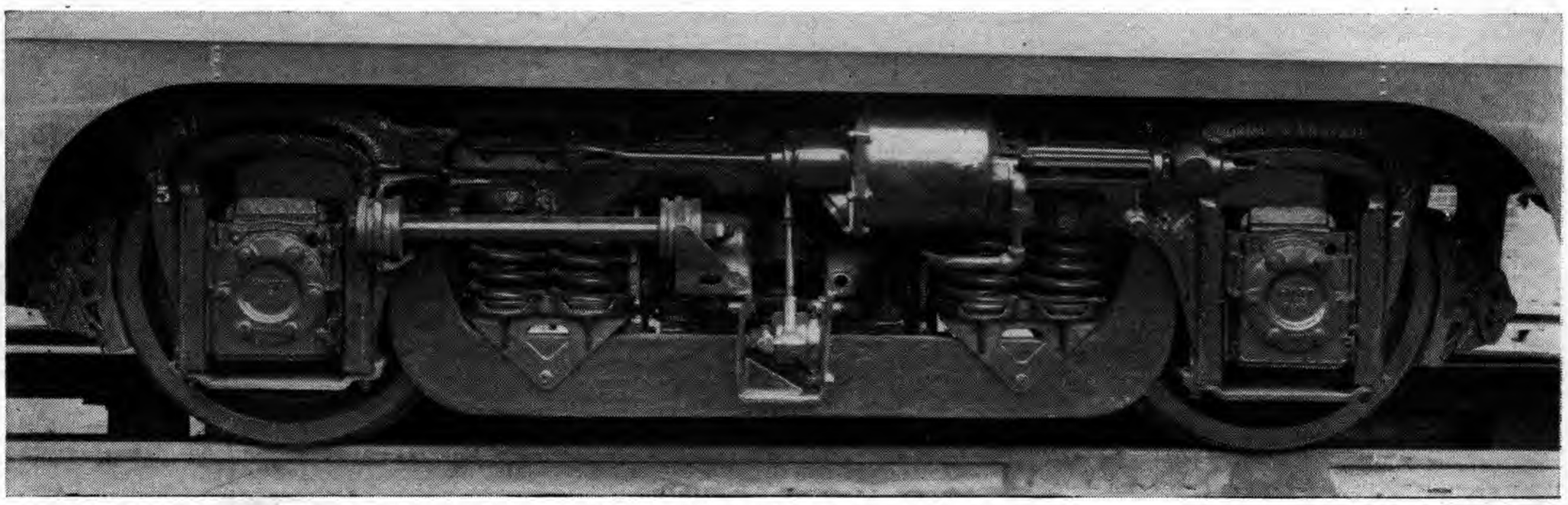


Gould special freight car trucks with span bolster—for very heavy cars.

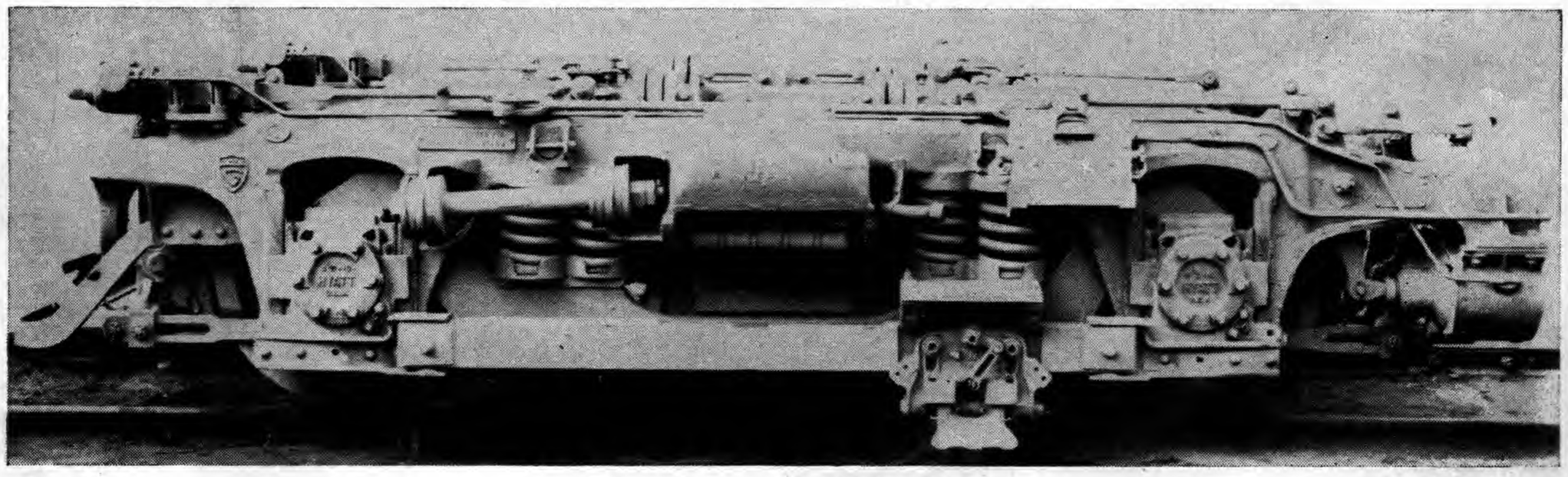
The Symington-Gould Corporation



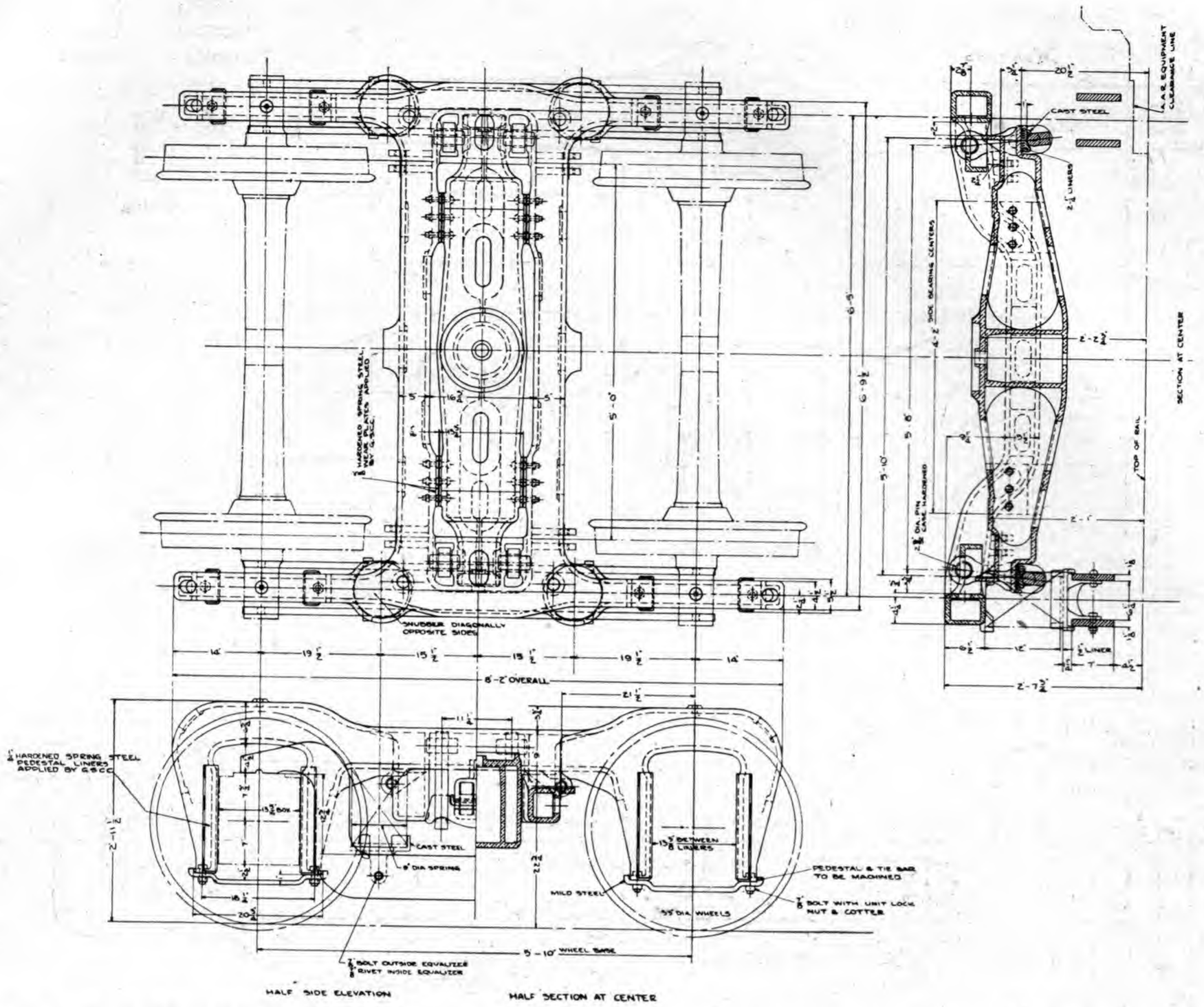
Above—Canadian Pacific four-wheel straight equalizer type passenger truck for coaches. Below—Canadian National six-wheel drop equalizer type truck for coaches.



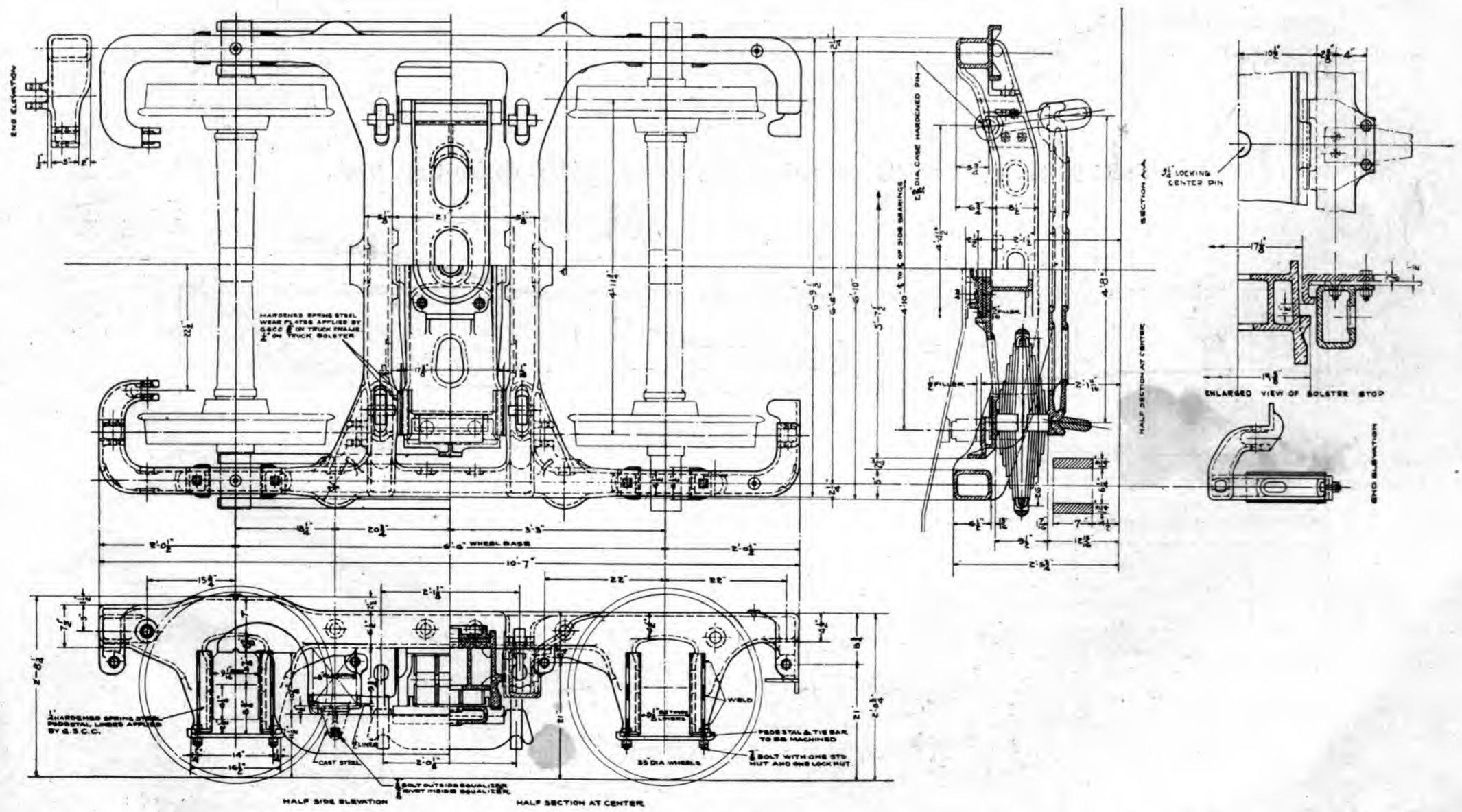
Above—Four-wheel all-coil spring single equalized truck (5½ in. by 10 in. journals) for the Wabash "City of Kansas City." Below—Commonwealth equalized swing-motion four-wheel motor truck with bolster anchor, bolster elliptic springs and equalizer coil springs for Long Island Railroad double-deck suburban cars.



General Steel Castings Corp.

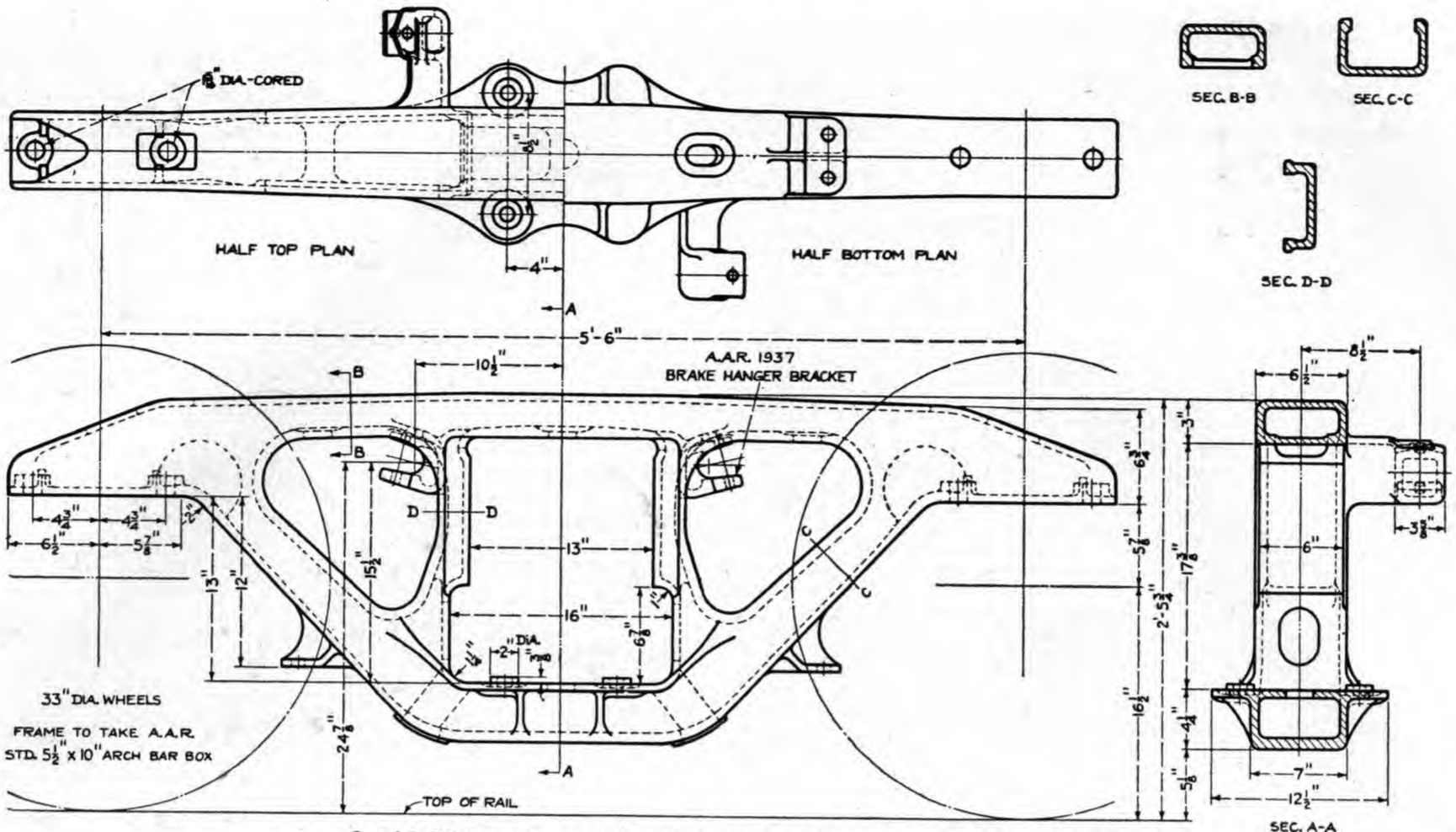


Commonwealth four-wheel swing bolster equalized truck, 5 ft. 10 in. wheel base arranged for single shoe brake, roller bearings and coil springs. Used on BX, box express cars.

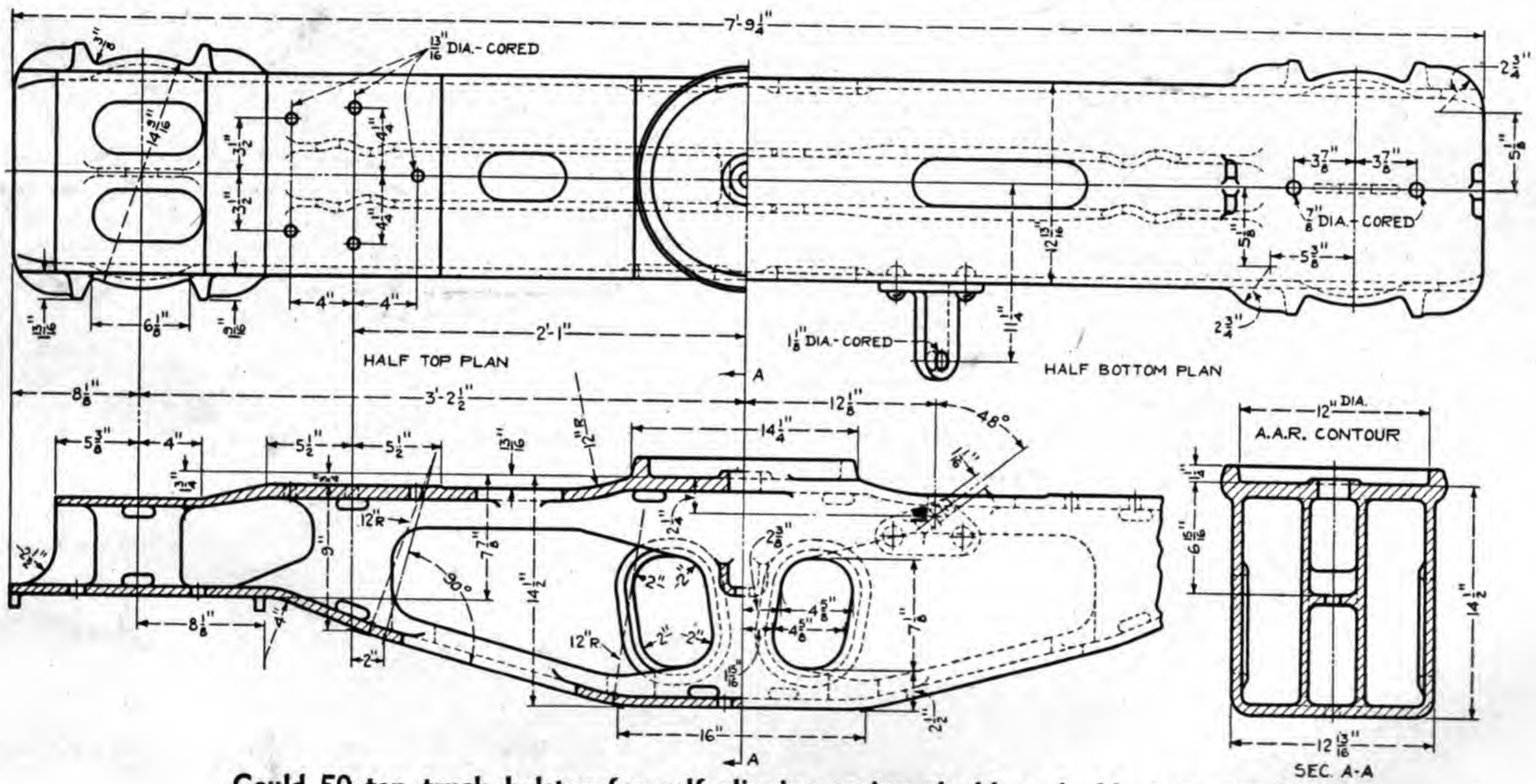

END ELEVATION
HARDENED SPRING STEEL WEAR PLATES APPLIED BY G.S.C.C. ON TRUCK FRAME, ON TRUCK BOLSTER
6'-6" WHEEL BASE
DIA CASE HARDENED PIN
SECTION A-A
HALF SECTION AT CENTER
LOCKING CENTER PIN
ENLARGED VIEW OF BOLSTER STOP
END ELEVATION
HARDENED SPRING STEEL PEDESTAL LINERS APPLIED BY G.S.C.C.
CAST STEEL
½" LINER
BOLT OUTSIDE EQUALIZER RIVET INSIDE EQUALIZER
WELD
PEDESTAL & TIE BAR TO BE MACHINED
BOLT WITH ONE STD NUT AND ONE LOCK NUT
33" DIA WHEELS
HALF SIDE ELEVATION
HALF SECTION AT CENTER

Commonwealth four-wheel swing bolster equalized truck, 6 ft. 6 in. wheel base, arranged for clasp brake and for coil and elliptic springs. Used on BX, box express cars.

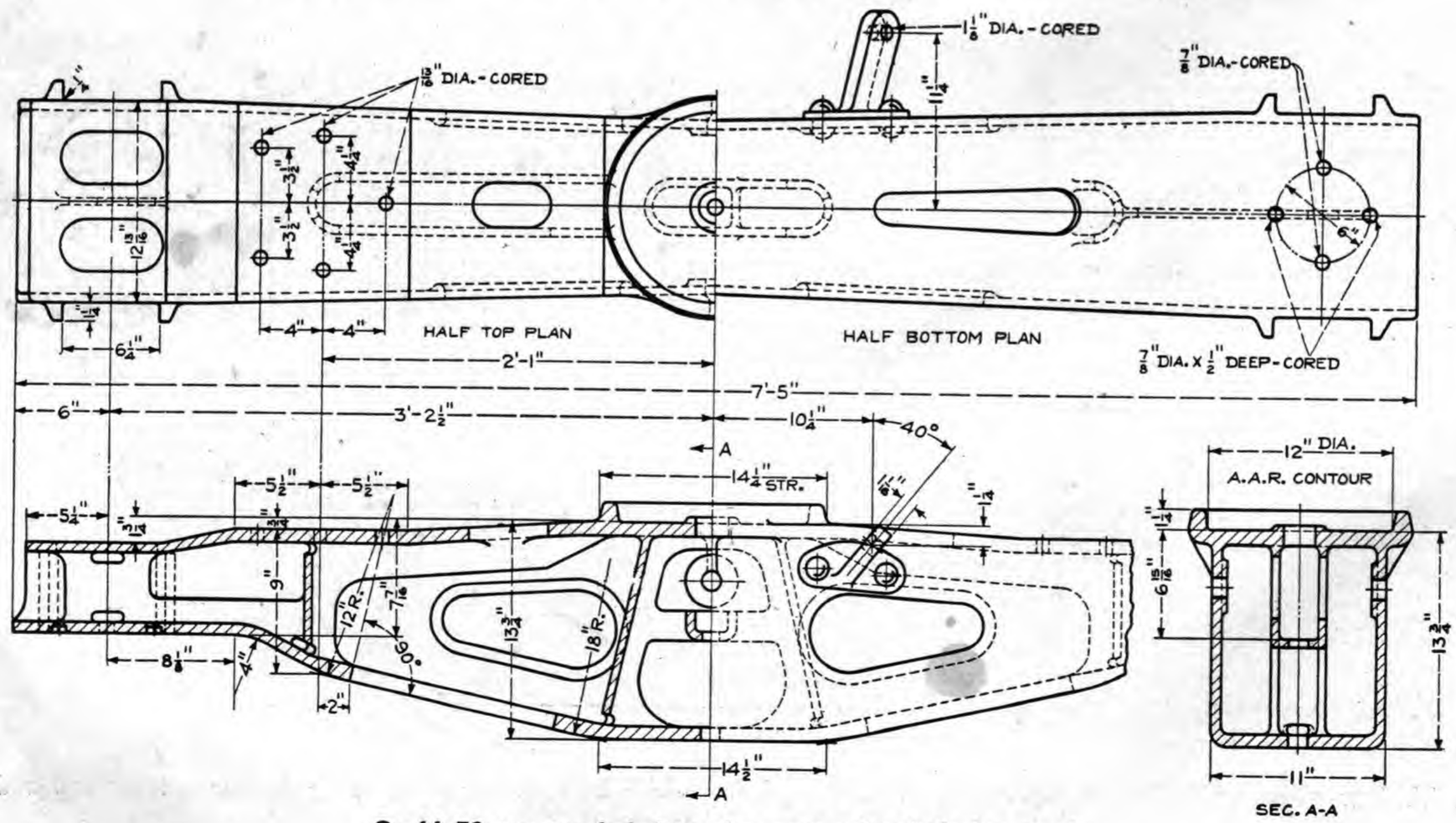
CAR TRUCKS: Side Frames; Bolsters



Gould 50-ton conventional design Andrews type truck frame.



Gould 50-ton truck bolster for self-aligning spring-plankless double-truss truck.

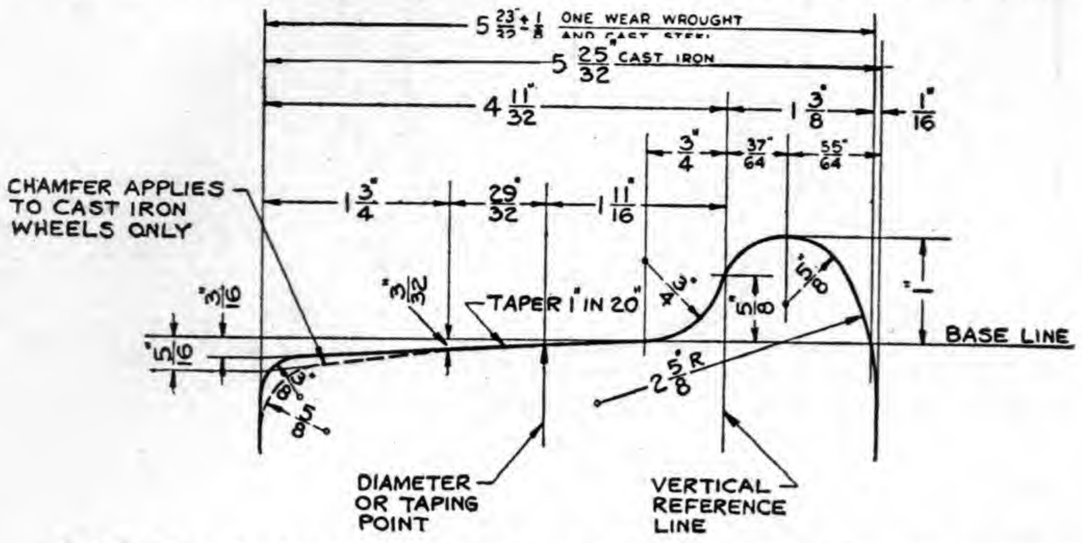


Gould 50-ton truck bolster for conventional design truck.

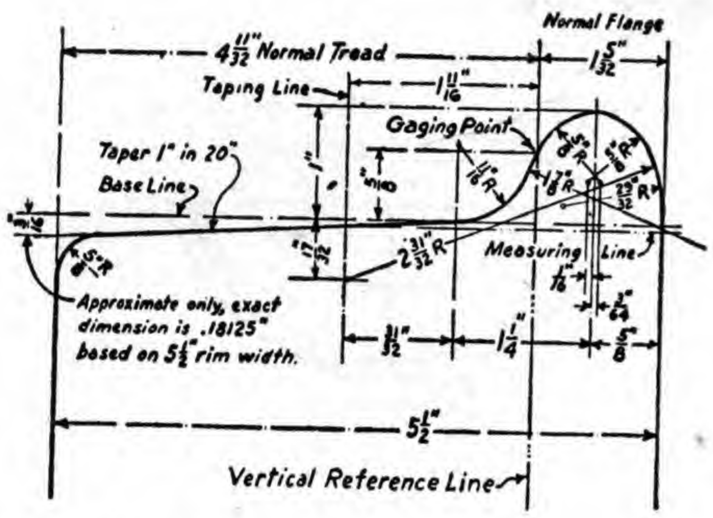
The Symington-Gould Corporation

Wheel and Axle Manual

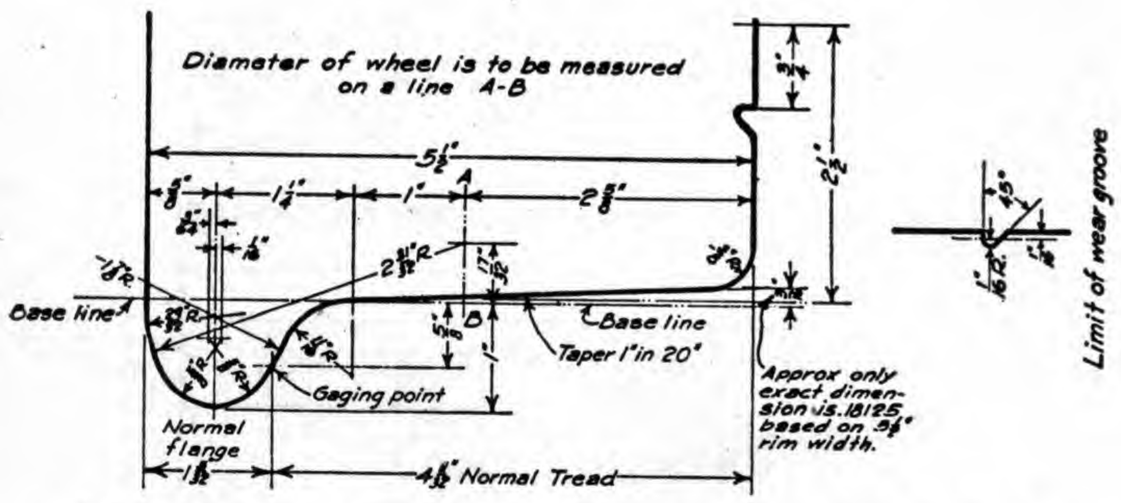
The "Wheel and Axle Manual" (Adopted in 1928 with subsequent revisions and supplements) which has been compiled under the auspices of the A.A.R. Committee on Wheels is a complete compendium of A.A.R. specifications, standards and recommended practices. It includes information as to wheel manufacture, shop procedure, tests, inspection, defects, and use of gages.



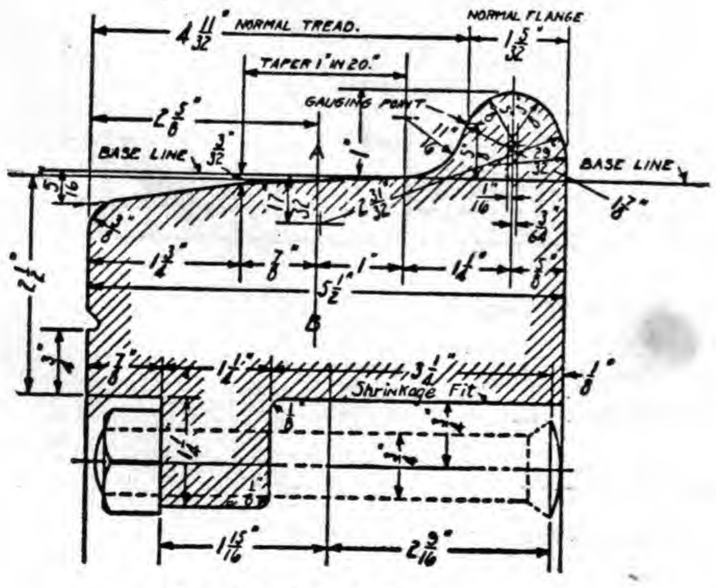
A.A.R. Standard wheel tread and flange for cast iron, one-wear wrought and cast steel wheels.
(Manual—Page G-3)



A.A.R. Standard tread and flange for multiple and two-wear wrought and cast steel wheels.
(Manual—Page G-4)



A.A.R. Standard wheel tread and flange for all steel-tired wheels.
(Manual—Page G-5)



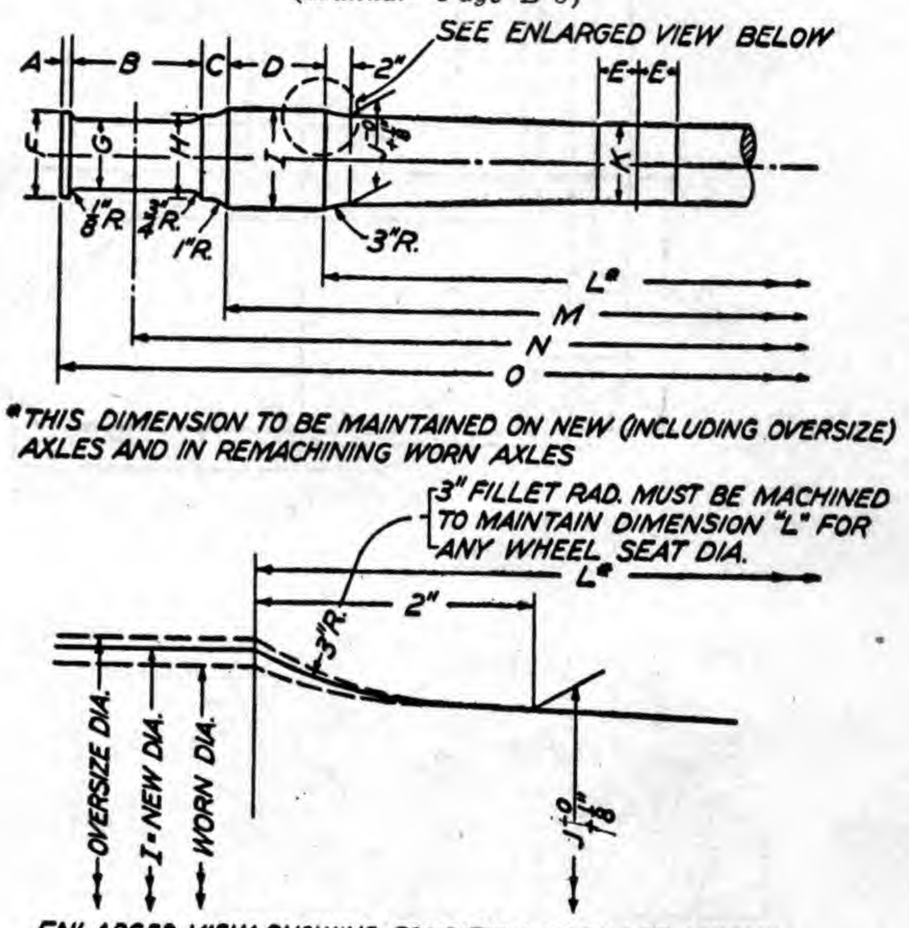
Diameter of wheels to be measured on line A—B.

A.A.R. Recommended tire fastening for steel tired wheels.
(Manual—Page G-9)

CLASSIFICATION OF AXLE	SIZE OF JOURNAL	DIMENSIONS A	B	C	D	DI	DJ	E	F	G	H	I	II	J	K	L	M	N	O
A	3 3/4" × 7"	5/8"	7"	2 1/2"	8 1/16"	13/16"	23/32"	1 1/2"	4 3/4"	3 3/4"	4 3/4"	5 1/8"	5 1/2"	4 7/8"	4 1/4"	3'-9 1/8"	5'-3"	6'-3"	6'-11 1/8"
B	4 1/4" × 8"	5/8"	8"	2"	8 1/16"	13/16"	23/32"	1 1/2"	5 1/4"	4 1/4"	5 1/16"	5 1/4"	6 1/8"	5 7/16"	4 3/4"	3'-9 1/8"	5'-3"	6'-3"	7'-0 1/4"
C	5" × 9"	5/8"	9"	2"	8 1/16"	13/16"	23/32"	1 1/2"	6 1/8"	5"	6 1/8"	6 1/2"	6 1/8"	6 7/16"	5 3/8"	3'-9 1/8"	5'-3"	6'-4"	7'-2 1/2"
D	5 1/2" × 10"	5/8"	10"	2"	8 1/16"	13/16"	23/32"	3"	6 5/8"	5 1/2"	6 5/8"	7"	7 3/8"	6 3/4"	5 7/8"	3'-9 1/8"	5'-3"	6'-5"	7'-4 1/2"
E	6" × 11"	7/8"	11"	2 1/4"	8 5/8"	1 1/8"	3/4"	3"	7 1/4"	6"	7 1/4"	7 5/8"	8"	7 1/8"	6 3/16"	3'-5 3/8"	5'-2 1/2"	6'-6"	7'-6 3/8"
F	6 1/2" × 12"	7/8"	12"	2 1/4"	8 5/8"	1 1/8"	3/4"	3"	7 3/4"	6 1/2"	7 3/4"	8 1/8"	8 1/2"	7 3/8"	6 1/8"	3'-5 3/8"	5'-2 1/2"	6'-7"	7'-8 3/8"

NOTE—THIS DESIGN OF AXLE MAY BE USED WITH THE 1946 DESIGNS OF WROUGHT STEEL WHEELS BY TURNING OFF 5/16 IN. OF THE AXLE BLACK COLLAR ON THE WHEEL SEAT SIDE

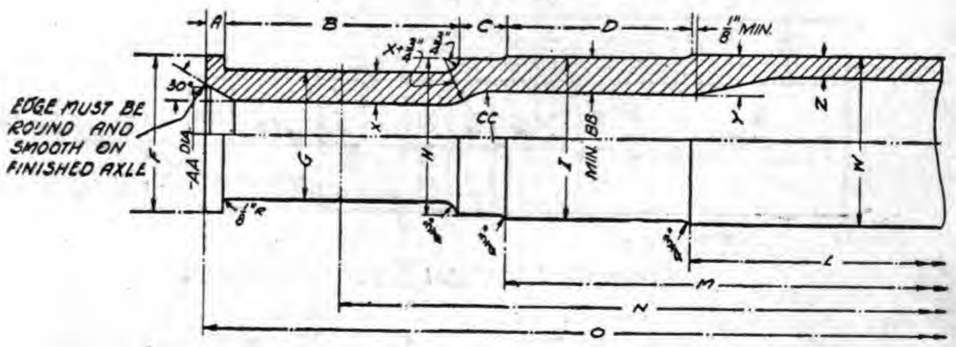
A.A.R. Standard freight car axles.
(Manual—Page D-6)



ENLARGED VIEW SHOWING CONDITION AT FILLET JOINING BODY PORTION OF AXLE TO INSIDE EDGE OF WHEEL SEAT

CLASSIFICATION OF AXLE	SIZE OF JOURNAL	DIMENSIONS A	B	C	D	E	F	G	H	I	J	K	L	M	N	O
A	3 3/4" × 7"	5/8"	7"	2 3/4"	7 5/8"	1 1/2"	4 3/4"	3 3/4"	4 3/4"	5 1/2"	4 7/8"	4 1/4"	3'-11 1/4"	5'-2 1/2"	6'-3"	6'-11 1/4"
B	4 1/4" × 8"	5/8"	8"	2 1/4"	7 5/8"	1 1/2"	5 1/4"	4 1/4"	5 1/4"	6 5/16"	5 7/16"	4 3/4"	3'-11 1/4"	5'-2 1/2"	6'-3"	7'-0 1/4"
C	5" × 9"	3/4"	9"	2 1/4"	7 5/8"	1 1/2"	6 1/8"	5"	6 1/8"	7"	6 3/16"	5 3/8"	3'-11 1/4"	5'-2 1/2"	6'-4"	7'-2 1/2"
D	5 1/2" × 10"	3/4"	10"	2 1/4"	7 5/8"	3"	6 5/8"	5 1/2"	6 5/8"	7 9/16"	6 3/4"	5 7/8"	3'-11 1/4"	5'-2 1/2"	6'-5"	7'-4 1/2"
E	6" × 11"	7/8"	11"	2 1/4"	7 5/8"	3"	7 1/4"	6"	7 1/4"	8 1/4"	7 5/16"	6 7/16"	3'-11 1/4"	5'-2 1/2"	6'-6"	7'-6 3/4"
F	6 1/2" × 12"	7/8"	12"	2 1/4"	7 5/8"	3"	7 3/4"	6 1/2"	7 3/4"	8 3/4"	7 7/8"	6 7/8"	3'-11 1/4"	5'-2 1/2"	6'-7"	7'-8 3/4"

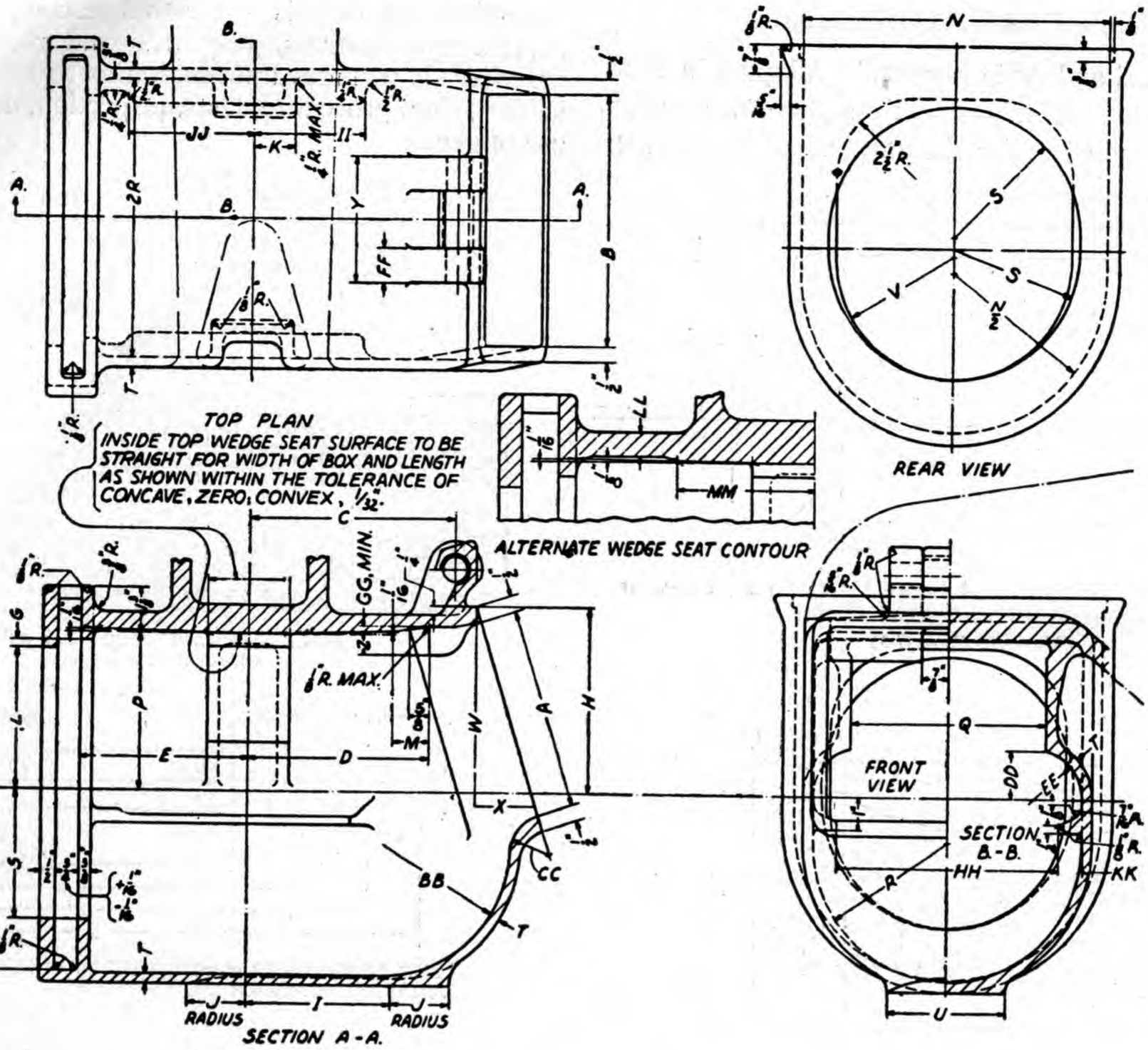
A.A.R. Standard passenger car axles.
(Manual—Page D-3)

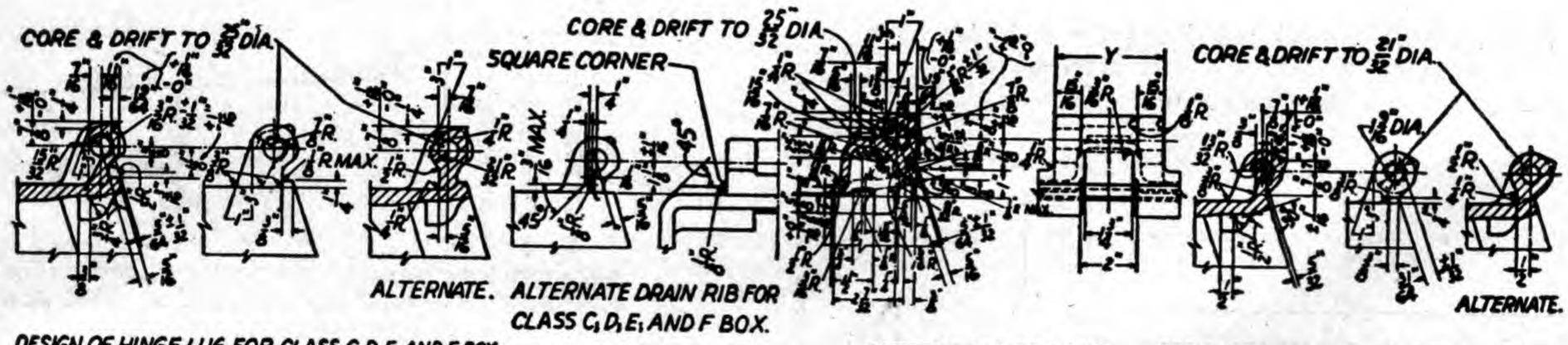


CLASSIFICATION OF AXLE	SIZE OF JOURNAL	A	B	C	D	F	G	H	I	L	M	N	O	W	X	Y	Z	AA	MIN BB	CC
B	4 1/4" × 8"	5/8"	8"	2 1/4"	8 1/8"	5 7/16"	4 1/4"	5 1/4"	5 3/16"	3'-10 1/4"	5'-2 1/4"	6'-3"	7'-0 1/4"	6"	1 1/16"	1 1/8"	3/8"	3"	1 13/16"	1 15/16"
C	5" × 9"	3/4"	9"	2 1/4"	8 1/8"	6 1/8"	5"	6 1/8"	6 1/2"	3'-10 1/4"	5'-2 1/2"	6'-4"	7'-2 1/2"	6 3/4"	1 3/16"	1 5/8"	7/8"	3 1/4"	1 7/16"	2 1/8"
D	5 1/2" × 10"	3/4"	10"	2 1/4"	8 1/8"	6 5/8"	5 1/2"	6 5/8"	7"	3'-10 1/4"	5'-2 1/2"	6'-5"	7'-4 1/2"	7 1/8"	1 1/2"	1 1/8"	1"	3 3/4"	1 11/16"	2 1/4"
E	6" × 11"	7/8"	11"	2 1/4"	8 1/8"	7 1/4"	6"	7 1/4"	7 5/8"	3'-10 1/4"	5'-2 1/2"	6'-6"	7'-6 3/4"	7 7/8"	1 5/8"	1 5/16"	1"	4 1/4"	1 3/4"	2 5/16"
F	6 1/2" × 12"	7/8"	12"	2 1/4"	8 1/8"	7 3/4"	6 1/2"	7 3/4"	8 1/8"	3'-10 1/4"	5'-2 1/4"	6'-7"	7'-8 3/4"	8 3/8"	1 5/8"	1 3/8"	1 1/16"	4 3/4"	2"	2 3/8"

A.A.R. Alternate Standard tubular axles.
(Manual—Page D-6A)

JOURNAL BOXES: A. A. R. Standards


TOP PLAN
INSIDE TOP WEDGE SEAT SURFACE TO BE STRAIGHT FOR WIDTH OF BOX AND LENGTH AS SHOWN WITHIN THE TOLERANCE OF CONCAVE, ZERO, CONVEX, 1/32".
ALTERNATE WEDGE SEAT CONTOUR
REAR VIEW
FRONT VIEW
SECTION B-B.
SECTION A-A.
RADIUS
RADIUS


CORE & DRIFT TO 25/32" DIA.
SQUARE CORNER
CORE & DRIFT TO 21/32" DIA.
1/2" DIA.
ALTERNATE.
ALTERNATE DRAIN RIB FOR CLASS C, D, E, AND F BOX.
ALTERNATE.

DESIGN OF HINGE LUG FOR CLASS C, D, E, AND F BOX.

ALTERNATE HINGE LUG FOR CLASS C, D, E, & F BOX.

DESIGN OF HINGE LUG FOR CLASS A AND B BOX.

CLASS OF BOX	SIZE OF JOURNAL	DIMENSIONS IN INCHES																																							
		A	B	C	D	E	F	G	H	I	J	K	L	M	N	P	Q	R	S	T	U	V	W	X	Y	Z	BB	CC	DD	EE	FF	GG	HH	II	JJ	KK	LL	MM
A	3 3/4 X 7	5 1/4	6 3/8	5 3/8	4	4 1/8	4 3/8	0	4 7/16	3 1/2	1 1/2	1 3/16	3 3/8	5/8	6 3/4	3 5/8	4 5/8	3 7/16	2 7/8	1/4	3	2 5/8	5 7/8	2	3 3/16	7/16	3 3/16	1	7/8	5/8	11/16	1/8	–	–	–	–	1/2	1 3/4
B	4 1/4 X 8	5 1/4	6 3/8	6 1/4	4 11/16	4 7/16	4 13/16	1/4	4 13/16	4 1/2	1 1/2	1 3/16	3 3/8	21/32	7 1/2	4	5	3 7/16	3 1/8	1/4	3	2 15/16	5 7/8	2	3 3/16	1/2	3 3/16	1	1	1 1/8	11/16	1/8	–	–	–	–	1/2	2
C	5 X 9	6 1/4	7 3/4	6 1/16	5 5/16	4 7/8	5 3/8	1/4	5 7/16	4 3/8	1 7/8	1 5/16	4 1/8	1 1/8	8 7/8	4 5/8	5 3/4	4 1/8	3 3/4	1/4	3 3/4	3 1/2	6	1 7/8	3 7/8	5/8	4 1/16	1 1/4	1 3/8	1 1/2	1 1/16	1/4	6 3/4	3	3 1/2	3/4	1/2	2 3/8
D	5 1/2 X 10	6 1/4	7 3/4	6 9/16	5 3/4	5 3/8	5 5/8	1/4	5 3/4	4 5/8	1 7/8	1 5/16	4 3/8	1 1/8	9 3/4	4 7/8	6 1/4	4 5/16	4	1/4	3 3/4	3 3/4	6	1 7/8	3 7/8	5/8	4 1/16	1 1/4	1 1/2	1 1/2	1 1/16	1/4	7 1/8	3 1/2	4	3/4	1/2	2 5/8
E	6 X 11	7 3/8	8 3/4	7 1/16	6 1/4	5 7/8	5 5/16	1/4	6 5/16	5 1/8	1 7/8	1 3/4	4 3/4	1 1/8	11 1/2	5 3/8	7 1/4	4 9/16	4 3/8	5/16	3 3/4	4 1/16	6	1 7/8	4 3/8	5/8	4 1/16	1 1/4	1 1/2	1 1/2	1 1/16	1/4	7 5/8	4	4 1/2	3/4	9/16	2 7/8
F	6 1/2 X 12	8 5/8	9 1/4	7 9/16	6 3/4	6 3/8	6 1/8	1/4	7	5 5/8	1 7/8	1 3/4	5 1/8	1 1/8	11 7/8	6	7 3/4	5 3/16	4 5/8	3/8	3 3/4	4 5/16	6	1 7/8	4 3/8	5/8	4 1/16	1 1/4	1 5/8	1 1/2	1 1/16	1/4	8 5/8	4 1/2	5	7/8	5/8	3 1/8
TOLERANCES +		1/8	1/8	1/8	1/32	1/16	1/8	–	1/8	–	–	1/32	1/16	–	1/8	1/16	3/32	1/8	1/16	–	–	1/16	–	–	1/32	0	–	–	–	–	–	–	–	–	–	–	–	–
TOLERANCES –		1/8	1/8	1/8	1/32	1/16	0	–	1/8	–	–	1/32	1/16	–	1/8	1/16	1/16	1/8	1/16	0	–	1/16	–	–	1/16	1/16	–	–	–	–	–	0	–	–	–	–	0	–

NOTES:

1. CHANGES WHICH DO NOT AFFECT INTERCHANGEABILITY ARE PERMISSIBLE IN THE JOURNAL BOX TO SUIT INDIVIDUAL MANUFACTURER'S FOUNDRY PRACTICE.
2. GAGES TO INSURE PROPER FIT OF APPLIED PARTS ARE SHOWN IN SECTION B. GAGE DESIGN AND CONSTRUCTION MAY VARY IF GAGING REQUIREMENTS ARE MAINTAINED.
3. THE LID FACE OF THE BOXES MUST BE REASONABLY STRAIGHT AND SMOOTH.

A.A.R. standard freight car journal boxes, integral type, Classes A, B, C, D, E and F.

(*Manual, Pages D-14, D-15*)